CANON T90

Similar models: mechanically similar to other T-series Canons

Batteries:
B1 -- 4ea AA-size (negative ground) operating batteries
B2 -- 1ea 3V lithium for memory (not user-replaceable)

Fig. 1 -- top cover lifted aside
Fig. 2 -- top view, covers removed
Fig. 3 -- bottom view, battery case lifted aside
Fig. 4 -- front view, covers removed
Fig. 5 -- top view, rewind end
Fig. 6 -- top view, release end
Fig. 7 -- back view
Fig. 8 -- release end, external LCD lifted aside
Fig. 9 -- top release end, mirror box removed
Fig. 10 - front view, mirror box and grip removed
Fig. 11 - mirror box, bottom view
Fig. 12 - mirror box, rewind side
Fig. 13 - mirror box, wind side
Fig. 14 - shutter block, front view
Fig. 15 - shutter block, side of control unit
Fig. 16 - shutter block, back view with cover and spacer removed
Fig. 17 - release end, palm wing open
Fig. 18 - front view, release side -- charge motor removed
Fig. 19 - bottom view, motor flex removed
Fig. 20 - bottom view, bottom base plate removed
Fig. 21 - bottom view, charge-cam gear and charge levers removed
Fig. 22 - bottom view, charge-mechanism base plate removed
Fig. 23 - finder LED display
Fig. 24 - finder LCD display
Fig. 25 - pictorial, DC/DC converter
Fig. 26 - pictorial, underside of external LCD (connections between main flex and OLC PCB)
Fig. 27 - IC4 and IC5 pin numbering
Fig. 28 - pictorial, top of main flex
Fig. 29 - pictorial, bottom of motor flex and front of main flex
Fig. 30 - pictorial, IC1 and IC3 (top of main flex, under external LCD)
Fig. 31 - pictorial, FD flex and D flex
Fig. 32 - block diagram and partial schematic

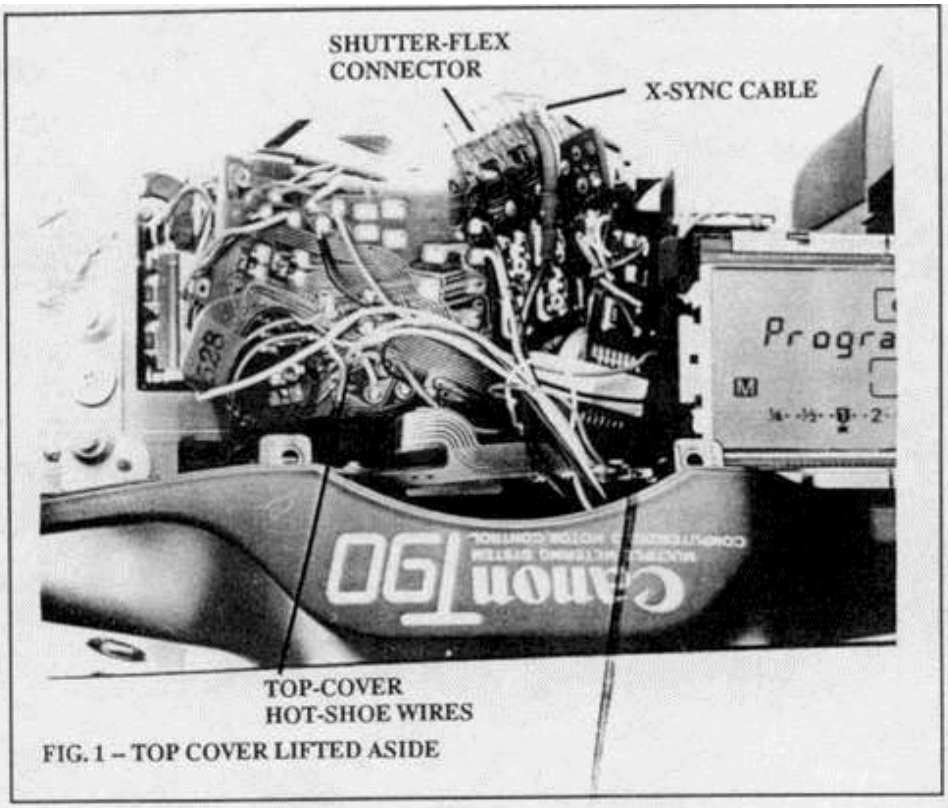


FIG. 1 -- TOP COVER LIFTED ASIDE

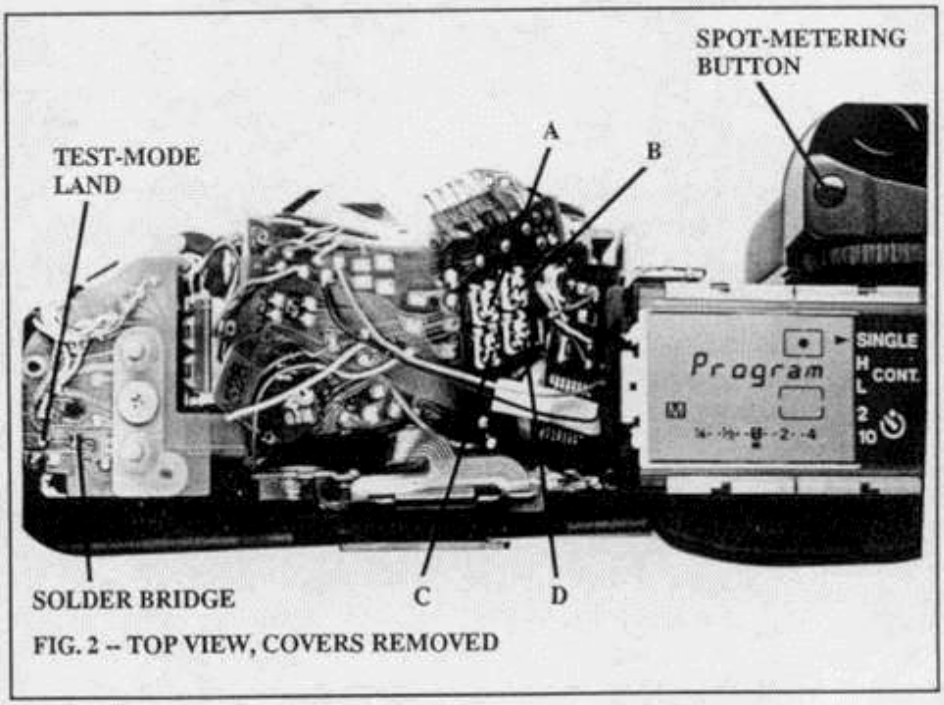


FIG. 2 -- TOP VIEW, COVERS REMOVED

ADJUSTMENT LOCATIONS

Spot level	
Average level	
Partial level	
Gain level	
Travel time, 1st curtain 1/4000	E
Flash TTL intensity	G
Flash FEL intensity	H*
Flash aperture information	I
Aperture size	
Partial area, horizontal	K**
Partial area, vertical	L**
Offset	M**
X-contact delay	N**
Travel time, 2nd curtain	O
AE overcharge	
Shutter overcharge	

* for the 300TL flash in the FEL mode -- requires the flash and a

means of measuring flash exposure through the lens
**normally do not disturb

ADJUSTMENT AND TEST VALUES

Curtain-travel time: 2.7ms +/- 0.2ms (Kyoritsu), 2.5mm (20mm distance)
Flange-focal distance: 44.14 +/- 0.02mm (flange to pressure-plate rails)
Winding-inhibit voltage: 3.6V +/- 0.2V
X-contact delay: over 0.2ms
K-factor: 12.5
Mirror-box adjustments: same as in other A-series and T-series Canons
Sprocket-gear timing: the line on top of the switch gear aligns with the timing punch mark on top of the upper sprocket gear, Fig. 9
Shutter overcharge: 0.2mm overtravel on the 2nd-curtain latch, Fig. 9 (check while running the charge motor). To adjust, change the adjusting collar **CA1-6441-000** on the shutter-charge 2 lever (collar Q in Fig. 19). Specify the size by the last 3 digits in the part #.
Diameters available: 022 (2.2mm), 024 (2.4mm), 026 (2.6mm), 028 (2.8mm), 030 (3.0mm), 032 (3.2mm), 034 (3.4mm), 036 (3.6mm)
AE overcharge: 0.9 - 1.1f (reading on Canon's tool lens) -- overtravel on diaphragm-setting lever, Fig. 4, during charge. To adjust, change the adjusting collar **CA1-6441-000** on the mirror-charge lever (collar P in Fig. 19). Specify the size by the last 3 digits in the part #.
Diameters available: 026 (2.6mm), 028 (2.8mm), 030 (3.0mm), 032 (3.2mm), 034 (3.4mm), 036 (3.6mm)**Voltages (6V applied):**
V-BAT. 6V battery voltage, measured to red wire on DC/DC converter, Fig. 25. For operation of DC/DC converter, motor-drive circuits, LED driver IC8, MG1 (aperture magnet), MG2 (release magnet), lamp for external-LCD illumination, LED1 (finder LED display), LED2 (finder-LCD illumination), and the self-timer LED3.
VDD. Around 5.4V, SW1 on (4.9V with SW1 off) operating voltage to IC3 and IC6. Switches to 1.2V with the reset switch closed to disable operation. Measure at D3, Fig. 29, or pin 58 of IC3, Fig. 30.

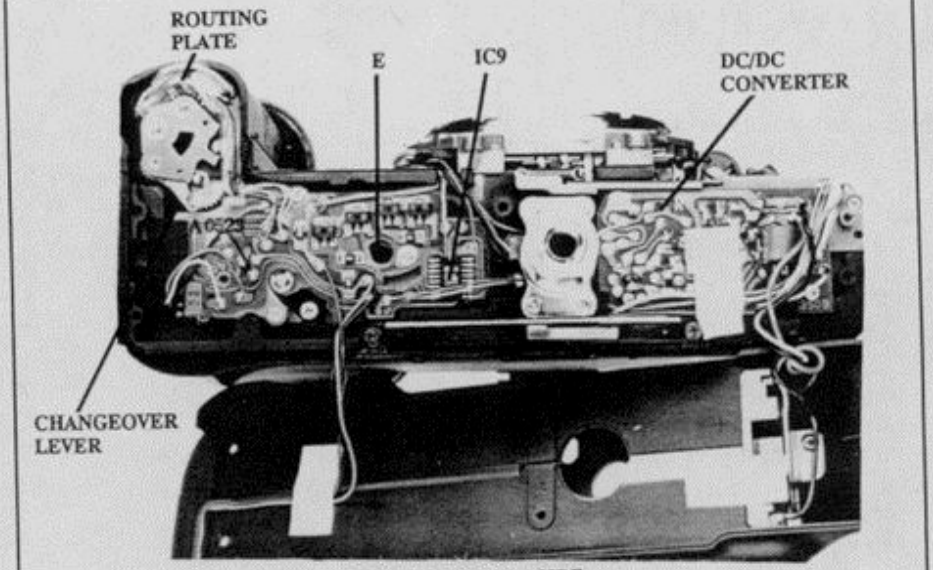


FIG. 3 -- BOTTOM VIEW, BATTERY CASE LIFTED ASIDE

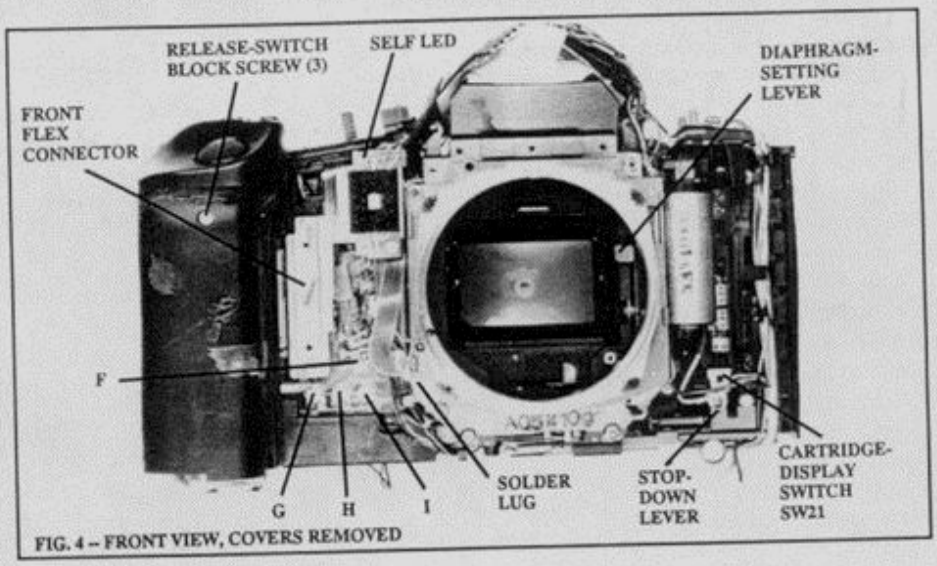


FIG. 4 -- FRONT VIEW, COVERS REMOVED

VPP. Around 15.2V, SW1 on, measured to orange wire at DC/DC converter, Fig. 25. Operating voltage for shutter magnets.
E1. Around 5V, SW1 on. Operating voltage for IC's (except for IC1 and IC2). Measure at the cathode of D5, Fig. 29.
E2. Around 5V, SW1 on (E1 voltage filtered by coil L1, Fig. 32). Operating voltage for the light-measuring IC's (IC1, IC2) and for IC4. Measure at pin 3 of IC1, Fig. 30.
VSS. Around 0.4V memory voltage to IC3 measured at VSS TP, Fig. 30. With the operating batteries removed, VSS switches to a negative voltage (around -2V) as the memory battery B2 charges capacitor C6. When the reset switch closes, VSS switches to 0V. **VC.** 1.22V from IC4 supplied to AV hot-shoe contact, Fig. 28, for dedicated-flash operation.
CCC. 1.245V from IC4 supplied to TV hot-shoe contact, Fig. 28, for dedicated-flash operation.
R-BAT. 1/2 V-BAT with the battery-check button depressed. Check at the R-BAT TP at the front of the main flex, Fig. 29.

ADJUSTMENT PROCEDURES

1. Curtain-travel times
Adjust both curtains by turning the worms (clockwise to increase tension). Reach the 1st-curtain worm through the access hole at the bottom of the camera (E in Fig. 3). To reach the 2nd-curtain worm, lift aside the LCD and the upper section of the main flex, Fig. 8. Fig. 9

shows the 2nd-curtain adjustment with the mirror box removed.

2. **1/4000**
Adjust F, Fig. 4, for an accurate 1/4000 (0.244ms).

3. **Exposure** (spot level, partial level, average level, gain)
a. Set the camera to test mode, as follows:
(1) Remove the solder bridge, Fig. 2 (disconnects pin 48 of IC5 from ground).
(2) Connect a jumper wire between the test-mode land, Fig. 2, and the E1 land on the FD-connecting flex (rewind side of pentaprism, lower section of main flex -- Fig. 28 shows both the test-mode land and the E1 land on the FD flex). With E1 supplied to the test-mode land (pin 48 of IC5), the camera is in the test mode.
(4) Push the release button part way. The finder LEDs turn on and stay on, showing the mode and the outputs of the A/D converters, Fig. 24. The f/stop LEDs show the mode, as follows:

Spot mode -- 03
Partial mode -- 02
Average mode -- 01

Change the mode by shorting the date contact, Fig. 7, to ground. When you first set the camera to test mode, the f/stop LEDs show 03 (spot mode). If the LEDs don't read 03, short the date contact to ground until you get the 03 reading. The highest reading is 07; each time you short the date contact to ground, the number decreases one increment.
(5) Check in spot mode (03) at EV12, top cover temporarily installed. Adjust VR2 (A in Fig. 2) until the AR1 LEDs, Fig. 24, read **d2**.
(6) Set partial mode (02). Check at EV12, top cover temporarily installed. Adjust VR3 (C in Fig. 2) until the AR1 LEDs, Fig. 24, read **d0**.
(7) Set average mode (01). Check at EV12, top cover temporarily installed. Adjust VR4 (B in Fig. 2) until the AR1 LEDs, Fig. 24, read **CE**.
(8) Set partial mode (02). Check at EV6, top cover temporarily installed. Adjust the gain (D in Fig. 2) until the AR2 LEDs read **68**.

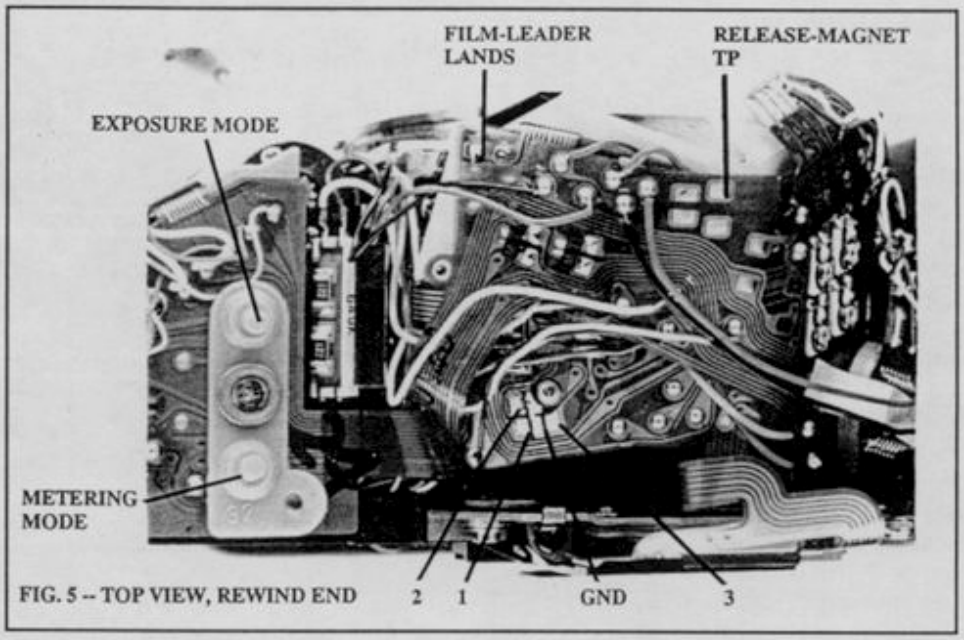


FIG. 5 -- TOP VIEW, REWIND END

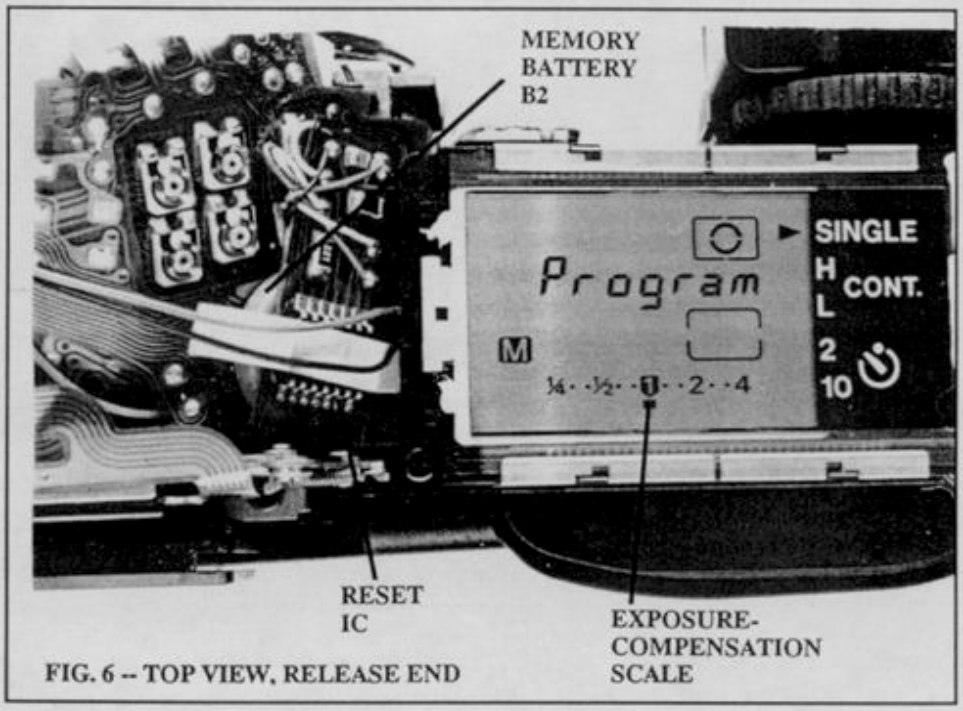


FIG. 6 -- TOP VIEW, RELEASE END

4. **Aperture**
a. Set AV mode, f/5.6 (lens at auto).
b. Measure the aperture with a transmission tester.
c. Adjust by bridging one or more of the aperture-adjust lands, Fig. 5, to the ground land (solder bridge), as follows:

- normal (0 correction) -- land 2 and land 3
- larger aperture by 1/8 -- land 2 only
- larger aperture by 2/8 -- land 3 only
- smaller aperture by 1/8 -- land 1 only
- smaller aperture by 2/8 -- land 1 and land 3
- smaller aperture by 3/8 -- land 1 and land 2
- smaller aperture by 4/8 -- all three lands

Note: You can check the effect by bridging lands with tweezers while you're measuring the transmission.

5. **Winding-inhibit voltage** (not necessary unless you've replaced IC4):
a. Measure and record the full battery voltage (V-BAT) between the V-BAT land and ground, Fig. 29.
b. Measure and record the R-BAT voltage at the R-BAT land with the battery-test button depressed (R-BAT).
c. R-BAT should be 1/2 V-BAT. Adjust by changing R10, Fig. 29.

6. **Flash adjustments** (adjustments at front of camera, Fig. 4)

Note: You can adjust the flash-aperture information without a special setup. However, the flash-intensity adjustments require a means of measuring the flash exposure through the lens. Canon recommends testing the flash exposure using a Kyoritsu EF500. Also, for the FEL-intensity adjustment, you need a 300TL flash -- earlier flash units don't have the FEL mode.
a. **Flash-aperture information**

Note: If you have access to an A or T series Canon Speedlite, adjust I, Fig. 4, until the aperture display in the finder matches that set on the Speedlite. If you don't have the Speedlite, adjust as follows (50mm lens installed):

(1) Connect a 3K resistor between the CCC terminal and ground. The camera then sets the 1/250 flash speed.
(2) Jumper the AV EF terminal to the CCC terminal. The LED finder display should now show f/4 when you close SW1.
(3) Adjust I, Fig. 4, until the finder displays f/4.

b. **FEL intensity**

Note: To check, you need the 300TL flash and the ability to measure the flash exposure at the film plane. If you have the direct probe for the Kyoritsu tester, you can measure the FEL intensity as follows:

(1) Assemble the T90 except for the front cover. Place the camera 2m from an 18% gray card.

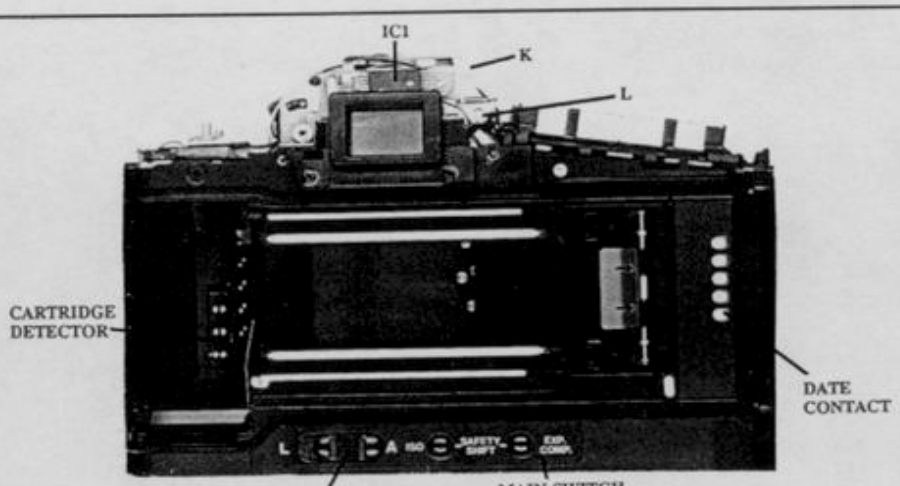


FIG. 7 -- BACK VIEW

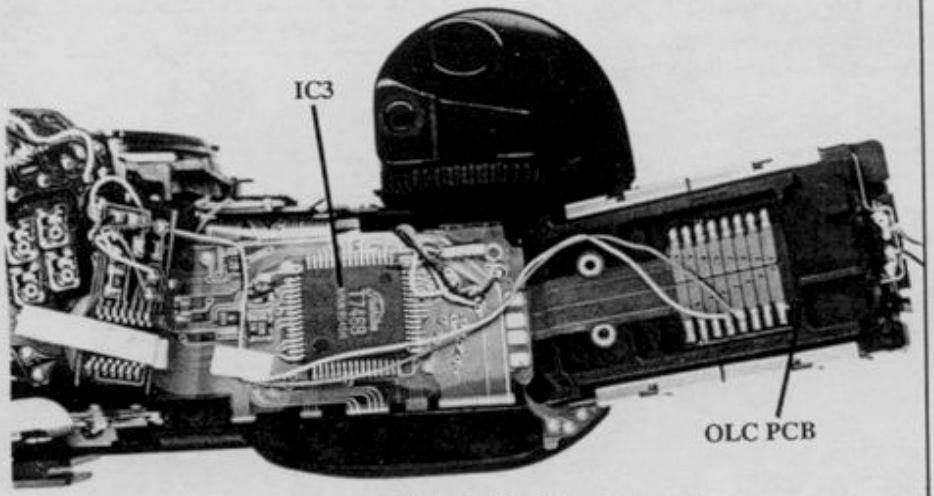


FIG. 8 -- RELEASE END, EXTERNAL LCD LIFTED ASIDE

(2) Set the camera to 1/250, ISO 100, manual f/5.6.
(3) Push the stop-down slide to stop down the diaphragm.
(4) Set the 300TL flash to the FEL mode. Set the flash head to the 35mm position.
(5) Darken the room.
(6) Push the spot-metering button, Fig. 2, to fire the preflash. Then release the shutter.
(7) In the direct mode, the tester should read 0.7 +/- 0.5F. Adjust with H, Fig. 4.

If you don't have the direct probe, you can use the still probe and measure the flash exposure through the lens of another camera (any Canon body that uses FD lenses). You also need matching FD lenses -- one for the T90 and one for the 2nd camera. Adjust as follows:
(1) Assemble the T90 except for the front cover. Place the 2nd camera and the T90 side by side with both cameras 2m from an 18% gray card.
(2) Install identical lenses with matched apertures on both cameras. Set the lenses to f/5.6.
(3) Load test film in the T90 and mount the 300TL flash. Set the flash to the FEL mode and set the flash head to the 35mm position.
(4) Set the T90 to 1/250, ISO 100. Actuate the stop-down slide to stop down the diaphragm to f/5.6.
(5) Hold open the 2nd camera on bulb. Place the probe in the aperture of the 2nd camera. When you fire the flash, the T90 controls the flash exposure -- but you measure the flash transmitted

through the f/5.6 aperture with the 2nd camera.
(6) Darken the room.
(7) Push the spot-metering button, Fig. 2. The 300TL fires the preflash to lock the flash-exposure information in memory.
(8) Release the T90. The flash fires, and the tester reads the flash exposure through the lens of the 2nd camera.
(9) Adjust H, Fig. 4, for a reading of 0.7 +/- 0.5F.

c. Flash TTL intensity

(1) Use the normal TTL mode on the 300TL -- no buttons pushed, none of the mode lamps lit. Or you can use another Canon TTL flash.
(2) You can use the same 2-camera test setup as described for the FEL adjustment. When you release the T90, you should get a reading of 0.7 +/- 0.5F on the Kyoritsu tester. Or use a flash meter at the film plane. Adjust G, Fig. 4, for a reading of f/5.6.

7. Partial area

Note: The eccentric adjustments, Fig. 7, position the selective-area SPC to read from the partial-area circle at the center of the focusing screen. The adjustments should not be necessary unless you have replaced related parts (IC1, eyepiece-shutter assembly, pentaprism frame). To adjust, Canon uses a mask with a 12mm hole in the center. With the mask in front of the light box, you have a small source of light. Check as follows:

a. Position the camera on a tripod in front of the mask. Use a 50mm lens set to the closest focusing distance.
b. Focus on the 12mm light circle. Position the camera until the light source is centered on the partial-area circle.
c. Set the metering mode to partial, the exposure mode to program, and the lens to f/5.6. Stop down the diaphragm.
d. Read the shutter speed through the finder.
e. Move the camera until the light source is off center in the partial-area circle and note the shutter speed.

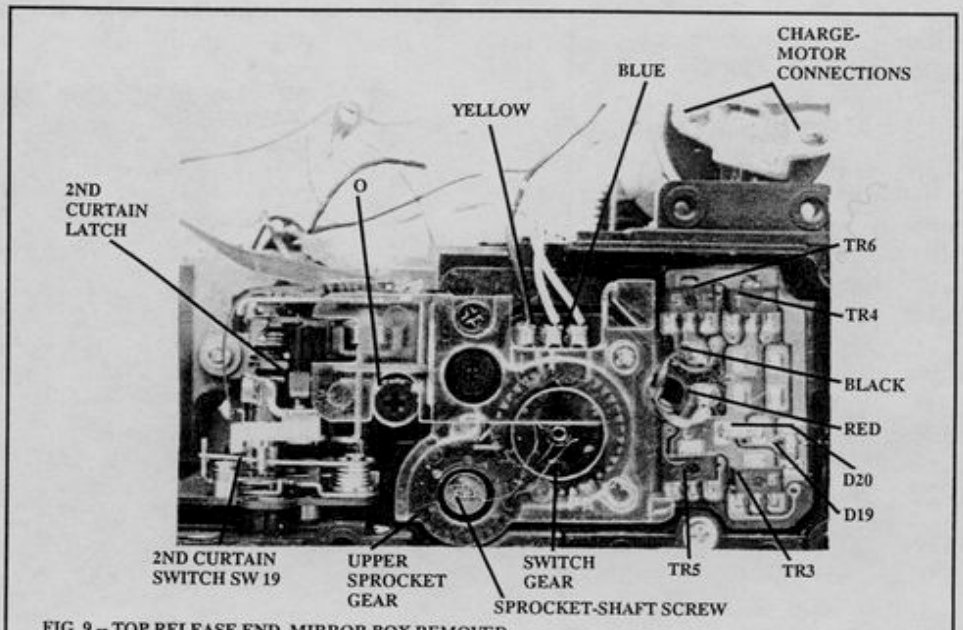


FIG. 9 -- TOP RELEASE END, MIRROR BOX REMOVED

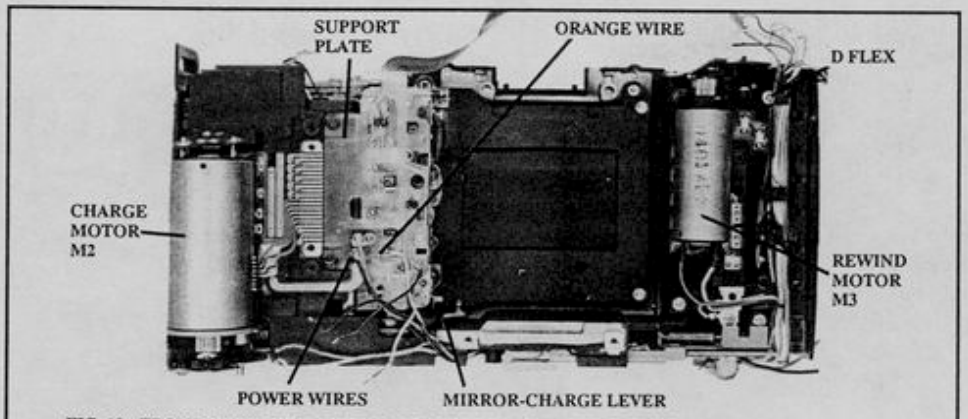


FIG. 10 - FRONT VIEW, MIRROR BOX AND GRIP REMOVED

f. You should get the lowest reading with the light source in the center of the partial-area circle. If not, you can adjust the position of IC1, Fig. 7 -- K moves IC1 horizontally, and L moves IC1 vertically.

LOCATIONS AND FUNCTIONS OF SWITCHES

SW1. Metering switch in release-switch block, white wire to bottom of motor flex, Fig. 29. Closes when you push the release button part way, turning on the finder display and the metering system. Pin 7 of IC3 switches from high (5.6V) to low (0.58V). Check between ground and the white wire or pin 7 of IC3.

SW1'. Preview switch in top cover, back release end (closest to end of camera). Closes (white wire to ground, Fig. 28) when you push preview button to turn on metering system. SW1' connects pin 7 of IC3 directly to ground.

SW2. Release switch in release-switch block, blue wire to bottom of motor flex, Fig. 29. Closes when you fully depress the release button to release the shutter. Pin 5 of IC3 switches from high (5.6V) to low (0.58V) with S2 on. Check between ground and the blue wire or pin 5 of IC3.

SW3. Reset switch in battery case, yellow wire, Fig. 25. Closes when you remove the batteries, switching pin 3 of IC3 low to disable all operation and reset the circuit. Opens when you install the battery holder to enable operation.

SW4. Battery-check switch on end panel (battery symbol), Fig. 17. Closing SW4 connects IC3 pin 4 to ground. IC3 tells IC4 to pulse the shutter magnets, putting the batteries under load. The external LCD shows "bc," and the film bars indicate the condition of the batteries (all bars for fresh batteries).

SW5. Exposure-mode switch, top rewind end (toward front of camera, Fig. 5). Closing SW5 connects IC3 pin 8 to ground. The external LCD displays the exposure mode. Hold SW5 closed and turn the dial switch to change the exposure mode.

SW6. Metering-mode switch, top rewind end (toward back of camera, Fig. 5). Closing SW6 connects IC3 pin 9 to ground. The external LCD displays the metering mode. Hold SW6 closed and turn the dial switch to change the metering mode.

SW7. Spot-metering switch in release-switch block, Fig. 2. Closing SW7 connects IC3 pin 10 to ground to turn on the LCD illumination (if the finder lever, Fig. 17, is in the light-bulb position). With the 300TL Speedlite installed, closing SW7 (red wire to ground, Fig. 29) initiates spot metering.

SW8. ISO switch on main-switch panel, Fig. 7. Connects to IC3 pin 12 through the pink wire, top rewind end of main flex, Fig. 28. When you close SW8, the external LCD shows the ISO setting. Hold SW8 closed and turn the dial switch to set a manual ISO.

SW9. Exposure-compensation switch on main-switch panel, Fig. 7. Connects to IC3 pin 13 through the brown wire, top rewind end of main flex, Fig. 28. Closing SW9 turns on the exposure-compensation scale, Fig. 6 (film loaded -- the exposure-compensation scale remains on with no film). Hold SW9 closed and turn the dial switch to set an exposure compensation.

SW10. Drive (winding)-mode switch on end panel, Fig. 17 (button at bottom labeled *S-C*). Connects to IC3 pin 14 through the front flex connector, Fig. 4. Pushing the

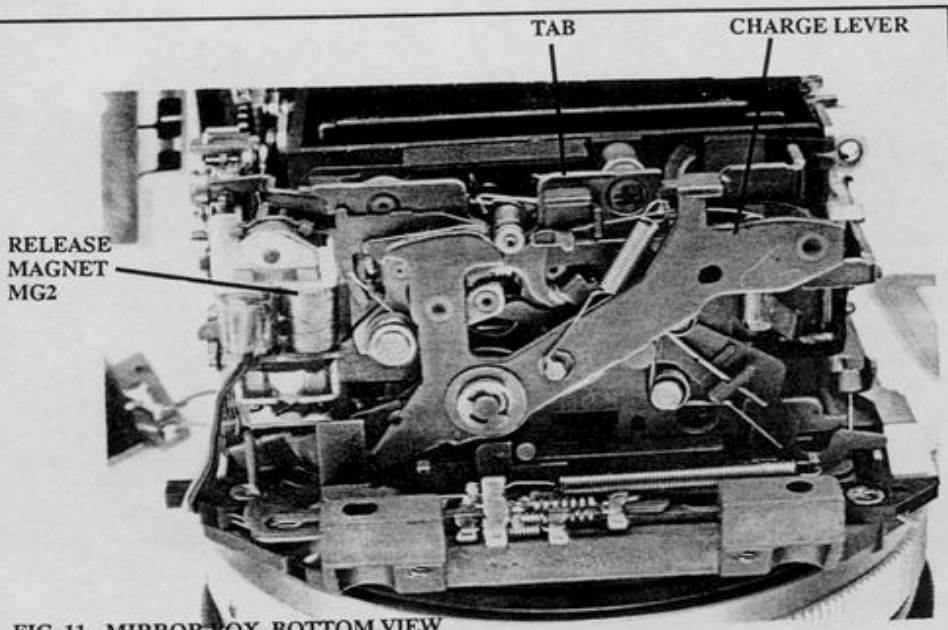


FIG. 11 - MIRROR BOX, BOTTOM VIEW

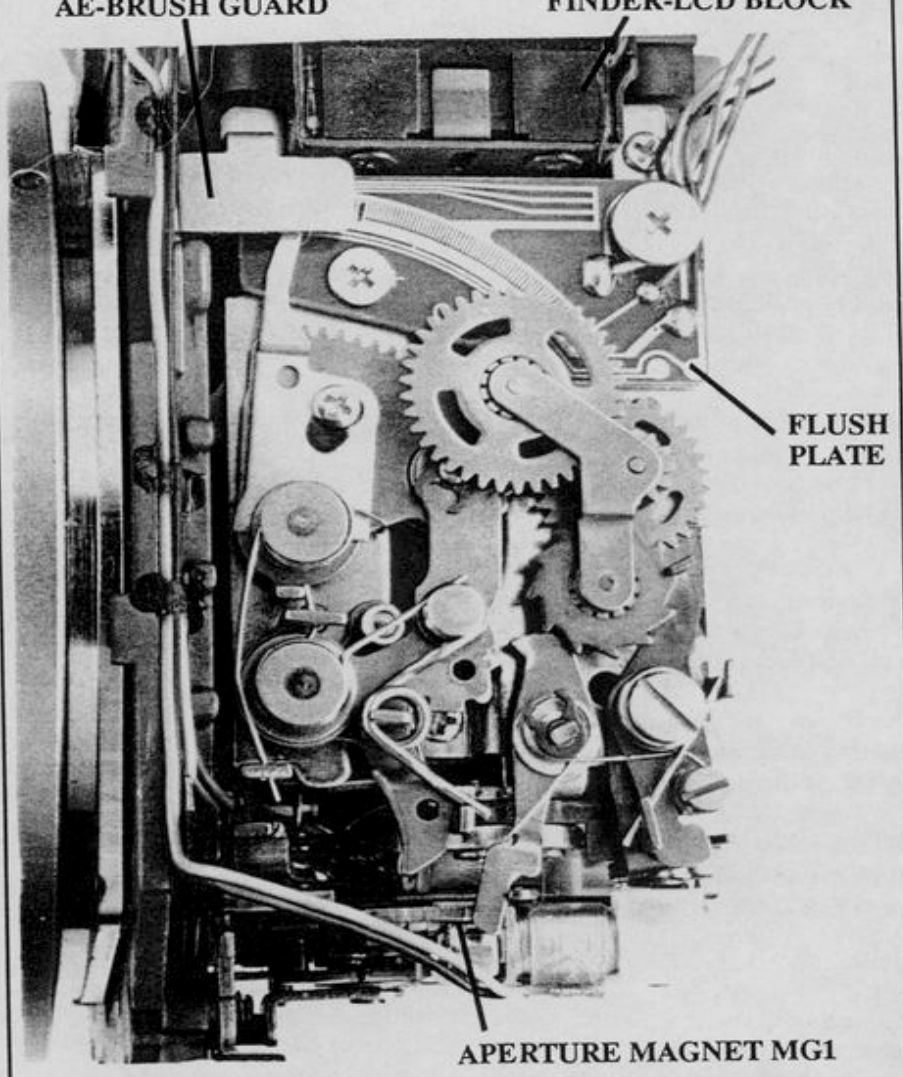


FIG. 12 - MIRROR BOX, REWIND SIDE

button closes SW10, connecting pin 14 to ground to set the drive mode and the self-timer delay time.

SW11. Manual-rewind switch on end panel (film-cartridge symbol), Fig. 17. Connects to IC3 pin 16 through the front flex connector, Fig. 4. With film loaded, closing SW11 runs the rewind motor to rewind the film.

SW12. AE charge switch, on flush plate, side of mirror box, Fig. 12. On (pink wire, Fig. 28, to ground) when the flush-plate brush is fully charged (diaphragm fully charged). Turns off as the brush moves down (moved by closing diaphragm). When on, SW12 connects pin 17 of IC3 to ground to tell IC3 that the mirror charge is complete.

SW13. Mirror switch on mirror box, Fig. 13 (direct connection to SP flex -- connects to IC3 pin 19 through front flex connector). Normally closed, connecting pin 19 to ground. Opens when the mirror is up, telling IC3 to release the shutter.

SW14. Charge-complete switch at bottom of camera, Fig. 21. As the charge-cam gear, Fig. 20, turns, it moves a brush along the contact plate. SW14 turns on (orange wire, Fig. 29, to ground) when the mirror-charge cycle is complete. Pin 40 of IC5 switches low. IC5 then shuts off the charge motor.

SW15. Charge-pulse switch at bottom of camera, Fig. 21. As the charge-cam gear, Fig. 20, turns, its brush moves along the contacts of SW15 to provide a pulse signal to pin 41 of IC5 (green wire, Fig. 29, to ground).

SW16. Main switch on main-switch panel, Fig. 7. Connects to IC3 pin 22 through the light-blue wire, top rewind end of main flex, Fig. 28. Turns on, light-blue wire to ground, with the main switch in the A position to allow operation.

SW17. Auto/manual switch on mirror box, Fig. 13 (direct connection to SP flex). Connects to IC3 pin 24 through the front flex connector, Fig. 4. Closed with the lens removed or the diaphragm set to a manual aperture, holding pin 24 low. Turns off with the lens at A; IC3 then turns off the "M" LCD and programs automatic diaphragm control through IC4.

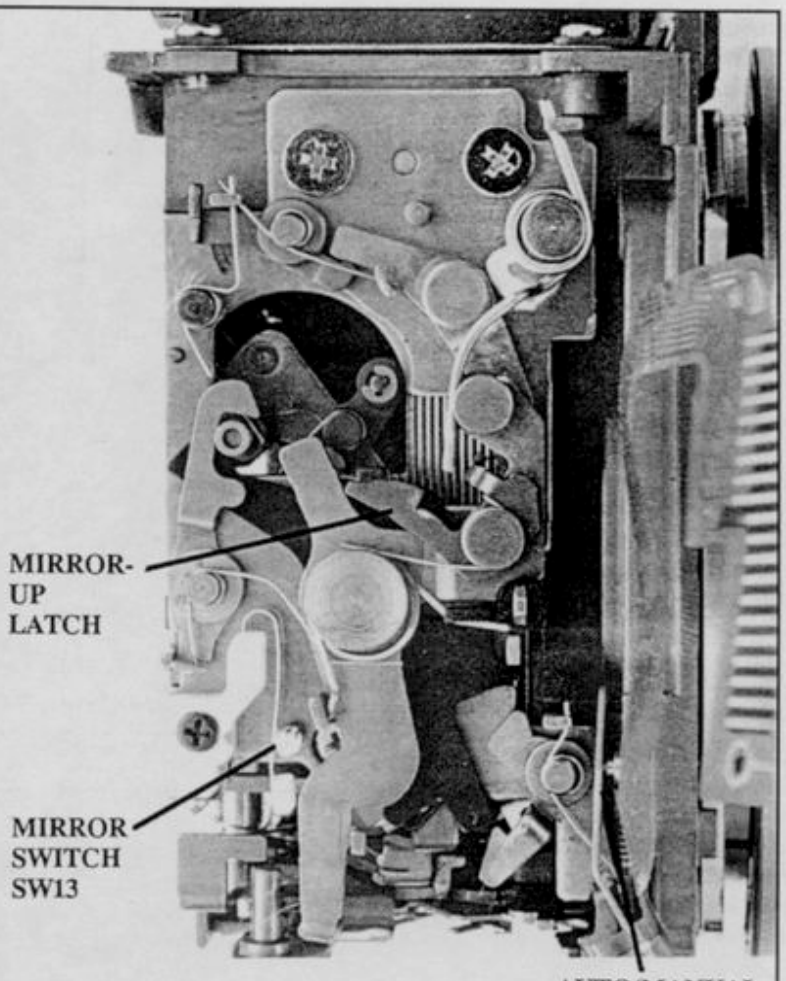


FIG. 13 - MIRROR BOX, WIND SIDE

SW18. 1st-curtain switch in shutter block (toward bottom, Fig. 15). Connects to IC3 pin 25 through shutter-flex connector, Fig. 1. Closed with the shutter charged, holding pin 25 low. Opens as the 1st curtain completes its travel. Pin 25 goes high, telling IC3 that the shutter is open. IC3 then times the exposure through IC4.

SW19. 2nd-curtain switch in shutter block (toward top, Fig. 9). Connects to IC3 pin 26 through shutter-flex connector, Fig. 1. Closed with the shutter charged, holding pin 26 low. Opens when the 2nd curtain completes its travel, telling IC3 that the exposure is complete. IC3 then tells IC5 to run the charge motor.

SW20. Stop-down switch at front of mirror box. Connects to IC3 pin 27 through the white wire, top of main flex, Fig. 28. SW20 closes when you actuate the stop-down slide, switching pin 27 low. The external LCD panel shows aperture symbol, and IC3 programs stopped-down metering.

SW21. Cartridge-display switch. In DX block, accessible at front of camera, Fig. 4. Connects to IC3 pin 28 through the gray wire, top rewind end of main flex, Fig. 28. SW21 opens when the film cartridge pushes in the cartridge detector, Fig. 7, to enable the film advance (if the back-cover switch SW22 is also open). When SW21 opens, the external LCD turns on the cartridge symbol.

SW22. Back-cover switch, top rewind end. Connects directly to the main flex, Fig. 28 (ground to pin 29 of IC3). Opens when you close

the back cover, enabling the film advance and initiating the auto load (if SW21 is also open). SW22 closes when you open the back cover to clear the rewind function and to disable the film advance.

SW23. Self-timer switch on end panel, Fig. 17 (lever switch, bottom). Moving the lever to the self-timer position (clock symbol) connects IC3 pin 30 to ground. IC3 then sets self-timer function.

SW24. Flush-plate code switch on mirror box, Fig. 12. Connects to IC3 pin 45 through the purple wire, top of main flex, Fig. 28. As the diaphragm closes, the flush-plate brush moves along the series of flush-plate contacts to generate a pulse signal (0.05V to ground). , purple wire to ground. IC3 counts the pulses to determine how far the diaphragm has closed.

SW25, 26. Electronic-input dial switch in release-switch block. Connect to the motor flex through the yellow and pink wires, Fig. 29, to the main flex through the front flex connector, Fig. 4, and to IC6 through the flex connector at the underside of the external LCD, Fig. 26. Turning the dial switch inputs on/off signals (off at each detent position) to change settings according to mode.

SW27. Wind-complete switch, on top of sprocket. Connects to the main flex through the yellow wire, Fig. 30, and to IC6 pin 88 through the flex connector at the underside of the external LCD, Fig. 26. A brush on the underside of the switch gear, Fig. 9, closes SW27 (yellow wire to ground) at the completion of the film advance. IC6 then tells IC5 to shut off the wind motor.

SW28. Viewfinder-illumination switch on end panel, Fig. 17. On with the finder lever in the light-bulb position. Connects to pin 25 of IC5 through the front flex connector, Fig. 4. In the on position, SW28 switches pin 25 low. IC5 then turns tells IC8 to turn on the illumination lamp for the external LCD and LED2 for the finder-LCD illumination when SW1 closes.

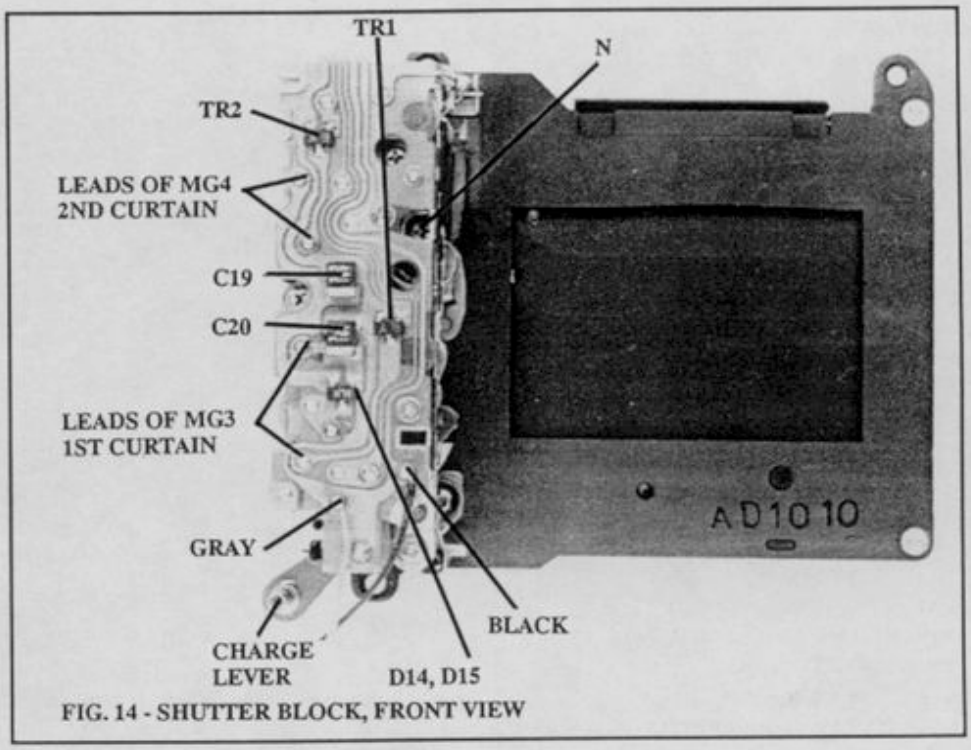


FIG. 14 - SHUTTER BLOCK, FRONT VIEW

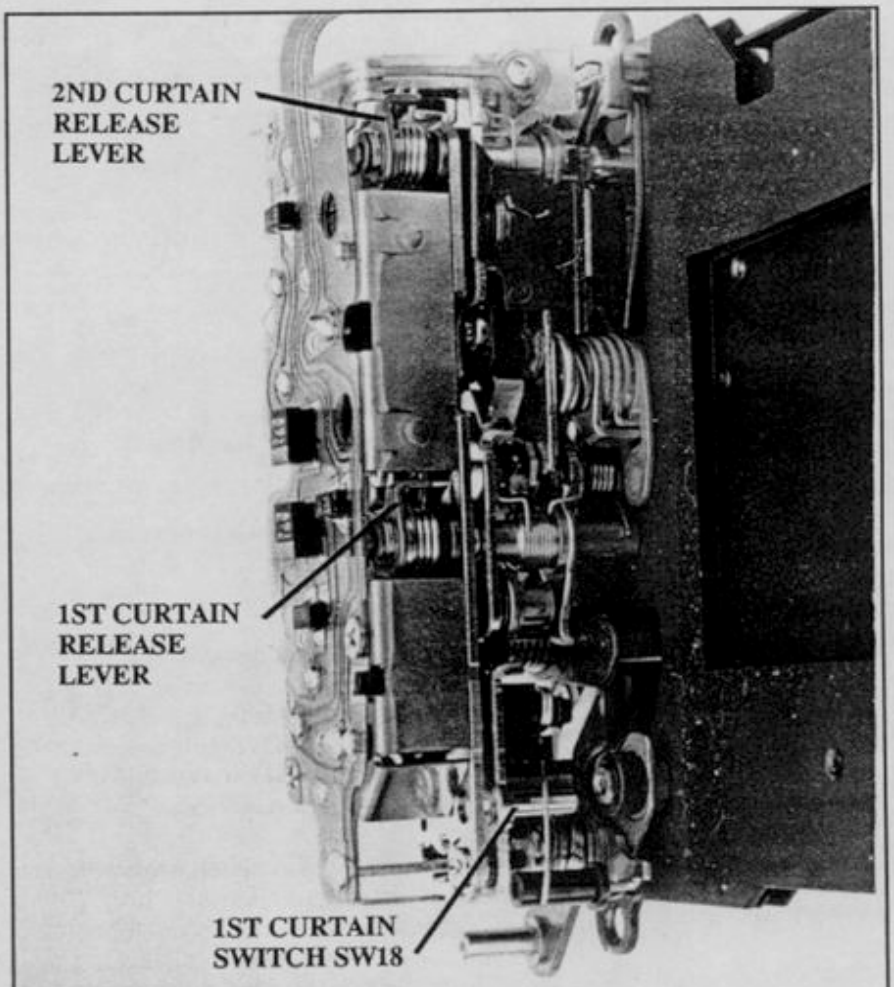


FIG. 15 - SHUTTER BLOCK, SIDE OF CONTROL UNIT

SW29. Highlight-control switch on top-cover switch panel, Fig. 28 (marked with an arrow pointing up). Connects to IC5 pin 37 through the blue top-cover wire, Fig. 28. When you're using the 300TL Speedlite in the FE-lock mode, the highlight and shadow switches allow you to independently control the exposure levels of the main subject (flash) and the background (ambient light). The finder LCD, Fig. 24, shows the exposure levels for the main subject and the background.

SW30. Shadow-control switch on top-cover switch panel, Fig. 28 (marked with an arrow pointing down). Connects to IC5 pin 38 through the pink top-cover wire, Fig. 28.

SW31. Film-winding switch on top of sprocket. Connects to IC5 pin 43 through the blue wire, Fig. 30. As the wind motor runs, the switch gear, Fig. 9, moves a brush contact along the SW31 contacts to generates a pulse (blue wire to ground). The pulse signal tells IC5 that the film is advancing and causes the movement of the film bars on the external LCD.

SW32. Viewfinder-information switch on end panel, Fig. 17. On with the finder lever in the circle position. Connects to IC5 pin 58 through the front flex connector. When on, SW32 switches pin 58 low. The finder LED does not turn on when you close SW1.

SW33 - 36. AVO switches on AE unit, Fig. 12 (opposite side from that shown in Fig. 12), controlled by maximum-aperture control pin. Input to IC5 for exposure calculation. The AVO inputs are either high or low depending on the maximum aperture of the lens. Check at the yellow, brown, red, and gray wires, Fig. 28, as you push in the maximum-aperture control pin. Each connection should switch to ground at some point in the movement.

Conditions with f/1.8 lens:
SW33 (gray) -- H (off)
SW34 (yellow) -- L (on)
SW35 (red) -- L (on)
SW36 (brown) -- L (on)

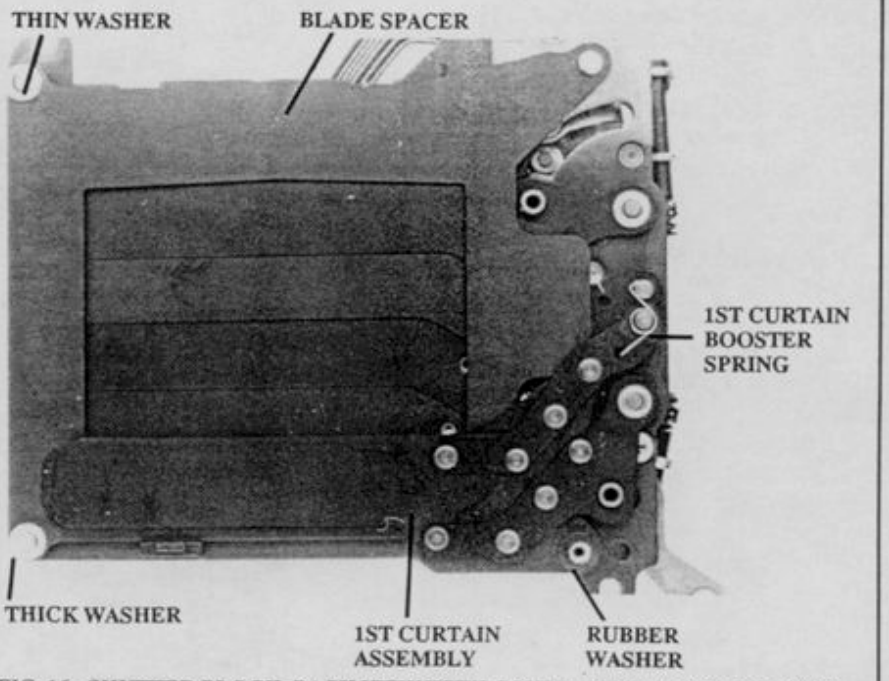


FIG. 16 - SHUTTER BLOCK, BACK VIEW WITH COVER AND SPACER REMOVED

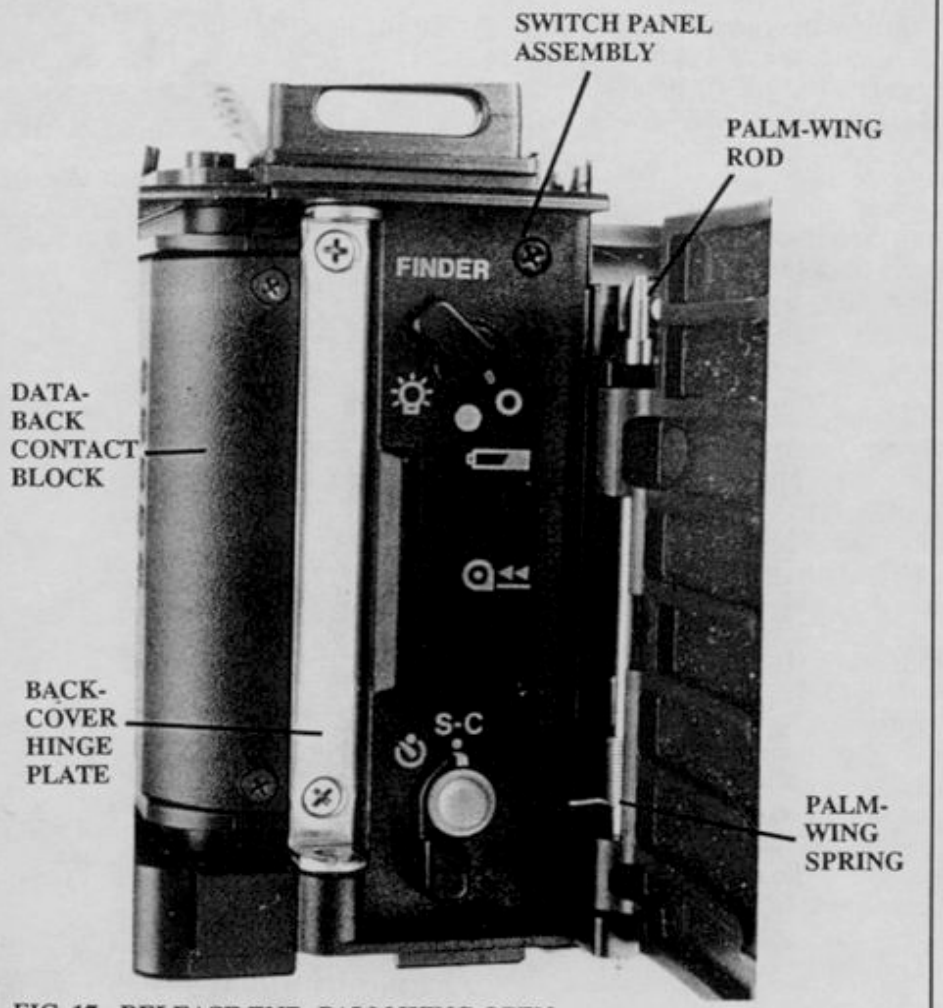


FIG. 17 - RELEASE END, PALM WING OPEN

SW43. DX switches on DX block. Input to IC8 through the connections between the D flex and the FD flex, Fig. 31. Provide information as the number of exposures as well as the ISO from the DX code on the cartridge.

LOCATIONS AND FUNCTIONS OF MOTORS

1. **Wind motor M1.** In take-up spool, connections to top of camera, Fig. 9. M1 runs in the slow-speed forward direction (red lead high) to advance the film -- both the spool and the sprocket turn. To disengage the sprocket during the auto load and at the start of the rewind, M1 runs in the high-speed reverse direction (black lead high) -- only the spool turns.

2. **Charge motor M2.** Inside grip, front release side, Fig. 10. Turns the gears at the bottom of the camera to charge the mirror and shutter. For the different drive speeds, the camera changes the current direction through the charge motor. Changing the direction of rotation changes the gearing. When M2 runs in the high-speed direction, the changeover lever moves as shown in Fig. 3. Running M2 in the low-speed direction moves the changeover lever to the position shown in Fig. 19. The rotational speed of the charge motor doesn't change.

3. **Rewind motor M2.** Front, rewind side, Fig. 10. During the wind cycle, M2 runs in the reverse direction (blue lead high) to free the fork. To rewind the film, M2 runs in the forward direction (pink lead high) and turns the fork.

LOCATIONS AND FUNCTIONS OF MAGNETS

1. **Aperture magnet Mg1.** Electromagnet on mirror box, Fig. 12, controlled by IC4. Energized when the shutter releases to hold its armature and allow the diaphragm to close. To set the aperture, IC4 switches the blue M1 lead high. M1 releases its armature to stop the diaphragm closure.

2. **Release magnet Mg2.** Hybrid magnet on mirror box, Fig. 11. To release the mirror, IC4 switches the black M2 lead low. M2 repels its armature to disengage the mirror latch.

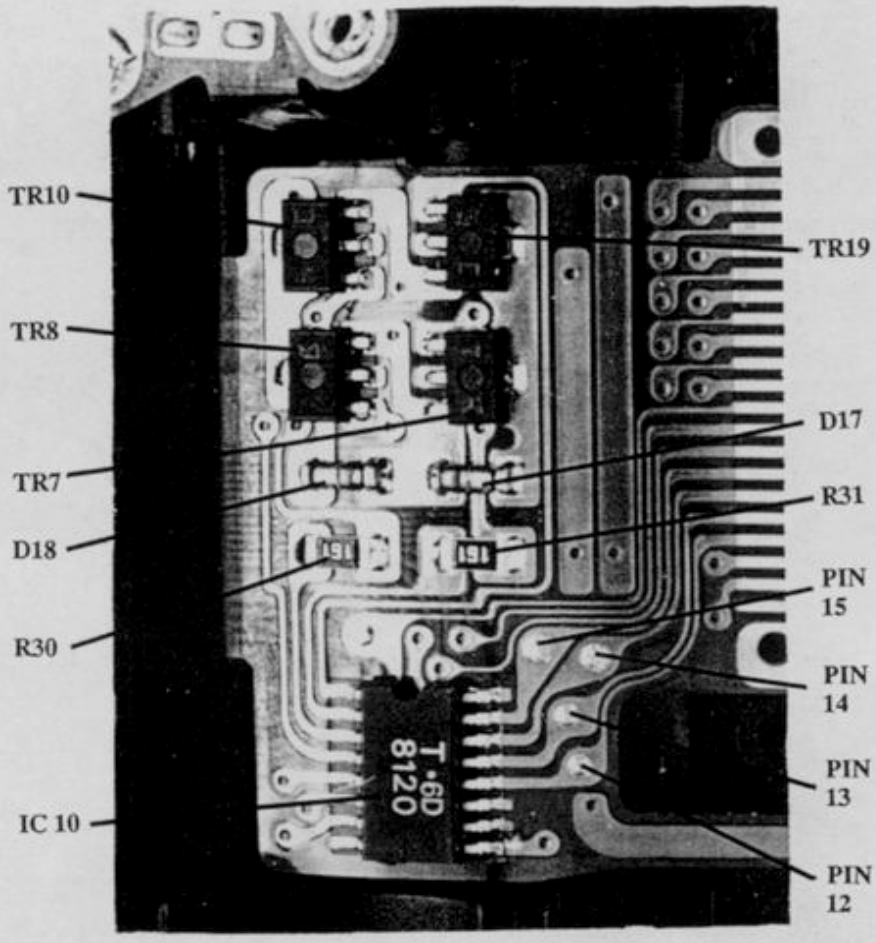


FIG. 18 - FRONT VIEW, RELEASE SIDE -- CHARGE MOTOR REMOVED

3. **1st-curtain magnet Mg3.** Hybrid magnet on shutter block (lower magnet), Fig. 14. To release the 1st curtain, IC4 switches on TR1, Fig. 32 (0.66V pulse to base). Current flows through Mg3. Mg3 repels its armature to disengage the 1st-curtain latch.

4. **2nd-curtain magnet Mg4.** Hybrid magnet on shutter block (upper magnet), Fig. 14. To release the 2nd curtain, IC4 switches on TR2, Fig. 32 (0.66V pulse to base). Current flows through Mg4. Mg4 repels its armature to disengage the 2nd-curtain latch.

LOCATIONS AND FUNCTIONS OF CIRCUIT BOARDS

1. **Main flex.** Top of camera and front release side. Contains ICs 1, 3, 4. Connects to the motor flex and the SP flex through the front flex connector, Fig. 4 (the main flex is the middle section).

2. **Motor flex.** Bottom of camera and front behind charge motor. Contains ICs 9 and 10.

3. **SP flex.** Spot-metering flex on mirror box. Contains IC2 for spot metering and TTL-flash control.

4. **FD flex.** Finder-data flex on top rewind side of pentaprism. Contains ICs 7 and 8 for driving the finder displays. Connects to the main flex through the 2 FD-flex connectors, Fig. 28.

5. **Shutter flex.** Front of shutter block, Fig. 14. Connects to the main flex through the shutter-flex connector, Fig. 1. Contains the 2 shutter magnets and the 2 transistors for driving the magnets.

6. **D (DX) flex.** Front of body, rewind end, Fig. 10. Connects the DX contacts to the FD flex. Supplied as a complete unit (D flex and DX-contact block).

LOCATIONS AND FUNCTIONS OF ICs

1. **IC1.** On main flex, section above eyelens, Fig. 7. Contains built-in SPD for partial and average light measurement. Provides the BV signal to IC4. The S30 signal from IC4, Fig. 30, determines whether IC1 takes a center-weighted or partial measurement (around 1.2V for center-weighted, a digital signal for partial). Supplied individually or as part of the main flex. See Fig. 30 for pin numbering.

2. **IC2.** Bottom of mirror box on SP flex. Contains built in SPD for spot metering and for TTL-flash control. Supplied as part of the SP flex (factory adjusted).

3. **IC3.** Top release side, accessible after lifting aside the external LCD, Fig. 8. Main CPU for overall sequence control. Operates at 32KHz with built-in crystal-controlled oscillator. Receives and processes the switch information (you can check most of the switches at IC3), drives the external LCD, provides the aperture-control and shutter-control signals to IC4. Supplied individually or as part of the main flex. See Fig. 30 for pin numbering.

4. **IC4.** On underside of main flex (under IC3), Fig. 26. Serial digital I/O interface that handles communication between IC3 and IC5 (sub CPU). Drives the release magnet, aperture magnet, and shutter-magnet transistors on command from IC3. Interface for the motor signals and the finder-display signals between IC3 and IC5. Communicates with the flash through the hot shoe. Supplied individually or as part of the main flex.

5. **IC5.** On underside of main flex (release side of pentaprism), Fig. 26. Sub CPU operating at 1MHz to control the viewfinder information and the motors. Drives IC6, IC7, IC8, and IC9. Supplied individually or as part of the main flex.

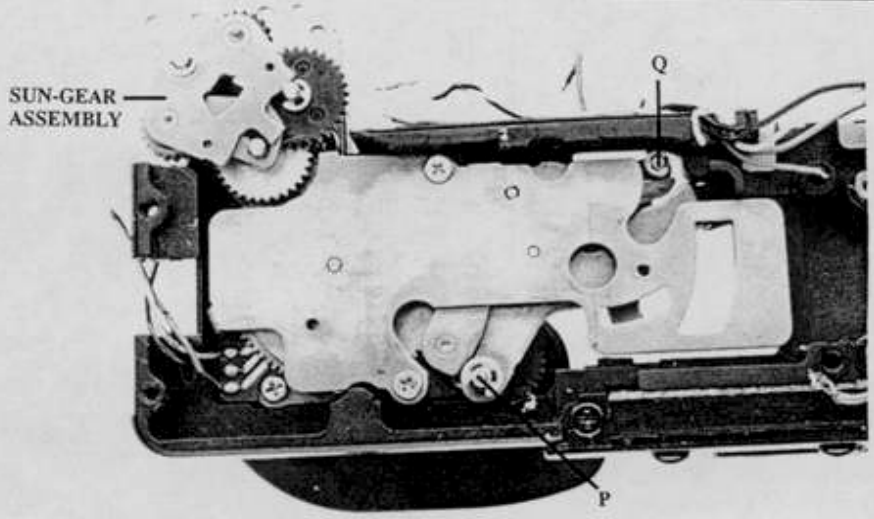


FIG. 19 - BOTTOM VIEW, MOTOR FLEX REMOVED

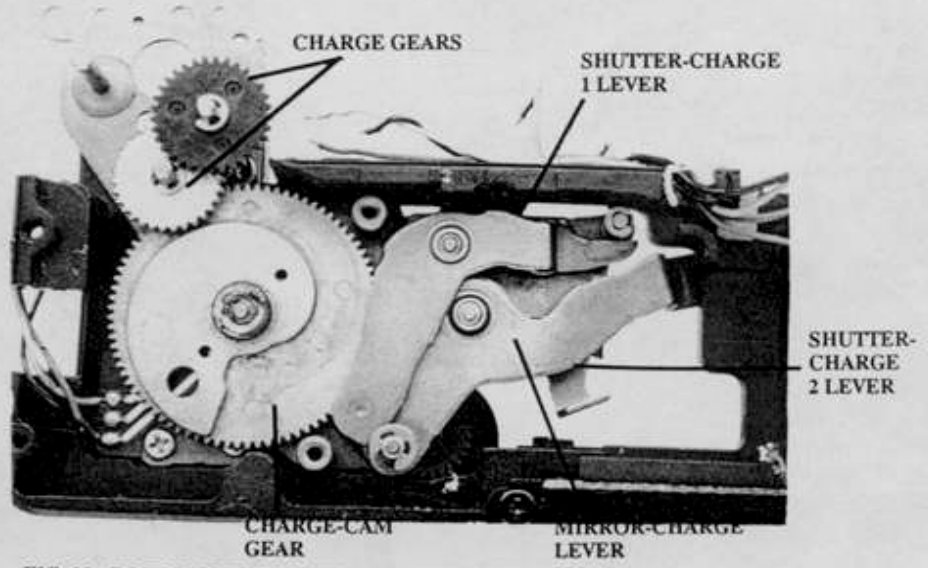


FIG. 20 - BOTTOM VIEW, BOTTOM BASE PLATE REMOVED

6. **IC6.** Driver for external LCD on OLC PCB, Fig. 8. Controlled by the main CPU. Supplied as part of the OLC PCB.

7. **IC7.** Driver for the finder LCD. On FD flex, rewind side of pentaprism (underside of flex). Controlled by the sub CPU. Supplied individually or as part of the FD flex.

8. **IC8.** Driver for the finder LED display. On FD flex, rewind side of pentaprism, Fig. 31. Controlled by the sub CPU and the I/O IC. Supplied individually or as part of the FD flex.

9. **IC9.** On motor flex, bottom of camera, Fig. 3. Driver for rewind motor M2. Controlled by the sub CPU. Supplied individually or as part of the motor flex. See Fig. 29 for pin numbering.

10. **IC10.** On motor flex, front of camera (section behind the charge motor, Fig. 18). Driver for charge motor M2 and wind motor M1. Controlled by sub CPU. Supplied individually or as part of the motor flex. Pin numbering is the same as IC9, Fig. 29.

Note: IC9 and IC10 are matching IC's. If you replace one, Canon recommends replacing both as a set.

OPERATING INSTRUCTIONS

1. Move the main switch, Fig. 7, to the A position to turn on the camera. The external LCD turns on, showing the exposure mode and the drive mode (arrow at right-hand edge of LED). If there's no film in the camera, the exposure-compensation scale also turns on, Fig. 6. If you have film loaded, the cartridge symbol and film bars replace the exposure-compensation scale. The cartridge symbol, film bars, and frame count remain displayed regardless of the main-switch position (film loaded).

2. After you load film and close the back cover, the camera auto loads to the first-frame position. During the auto load, the external LCD shows the ISO. The film bars flash to indicate film advance. After the auto load, the counter shows "1," and the external LCD shows the mode. The main switch must be in the on position to auto load the film.

3. If the cartridge isn't DX-coded, the ISO LCD flickers during the auto load. The flickering ISO remains on until you depress the release button, warning you that the SV information hasn't been set. Set a manual ISO by holding in the ISO button, Fig. 7, and turning the dial switch, Fig. 2. Once you've set the ISO manually, ISO LCD stops flickering. The ISO then turns on only when you depress the ISO button. You can also use the manual ISO setting to override the DX code.

4. If the film doesn't load properly, the camera won't release after the auto load. The film bars flash to indicate misload. Open the back cover to clear the misload condition.

5. The camera also detects the number of frames from the DX coding. When you push the release button part way, the finder LCD turns on (right-hand edge of screen). The remaining-frame display appears at the bottom of the finder LCD. The display shows "F" until you reach the 9th frame; the display then counts down each time you release the shutter. If the film isn't DX coded, the display only shows "F." With no film, the finder LCD only turns on at the spot-metering setting.

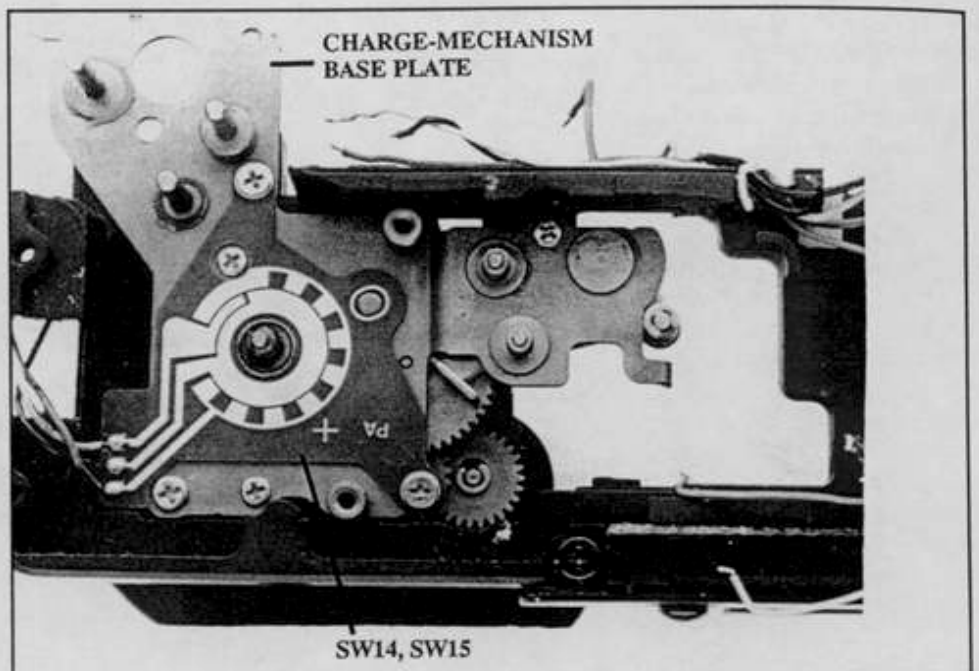


FIG. 21 - BOTTOM VIEW, CHARGE-CAM GEAR AND CHARGE LEVERS REMOVED

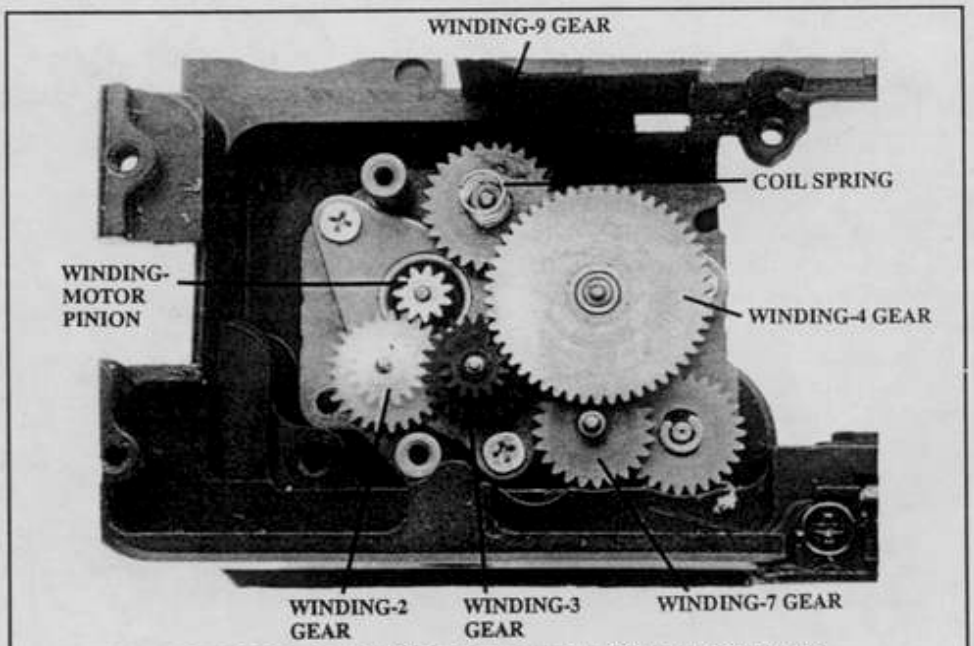


FIG. 22 - BOTTOM VIEW, CHARGE-MECHANISM BASE PLATE REMOVED

6. After you've shot the last frame according to the DX code, the camera switches to rewind mode. If the cartridge isn't DX coded, the camera enters rewind mode after sensing the end of the film. After the rewind, the cartridge-symbol LCD flashes and the camera won't again operate until you open the back cover. You can rewind in mid roll by pushing the manual rewind button -- open the palm wing (rewind end of camera) to reach the button. The film rewinds completely into the cartridge. However, you can modify the circuit to stop the rewind with a section of leader still extending from the cartridge (see, *REVISED SECTIONS*).

7. The finder lever, Fig. 17, controls the finder LEDs and the LCD

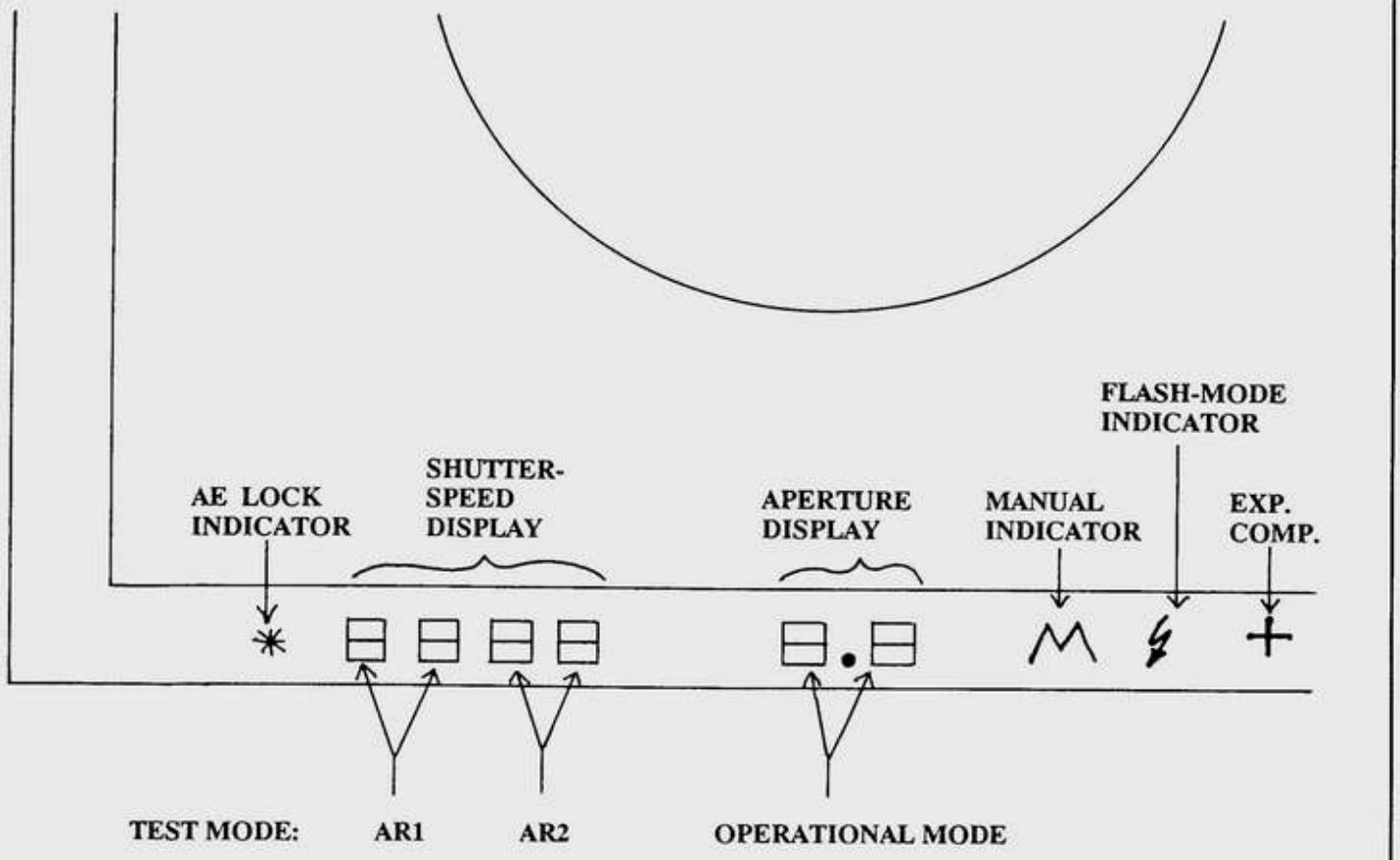


FIGURE 23 - FINDER LED DISPLAY

illumination. With the finder lever at the light-bulb symbol, the finder LEDs turn on when you push the release button part way or when you push the preview button (back of top cover, near end of camera). Also, the LCD illuminator turns on to illuminate the external LCD. The LCD illuminator remains on around 1 second after you let up the release button. The LCD illuminator also turns on when you push the spot-metering button, Fig. 2. With the finder lever at the setting indicated by a filled-in circle, the finder LEDs -- but not the LCD illuminator -- turn on. At the circle setting, neither the finder LEDs nor the LCD illuminator turn on.

8. Pushing the battery-test button, Fig. 17, puts the batteries under load by pulsing the shutter magnets. The external LCD shows "bc" and the film bars. If the batteries are fresh, the LCD shows 3 film bars. If the LCD shows 2 film bars or 1 film bars, the batteries are getting low. No film bars and a flashing "bc" means that the batteries are too low for proper operation; the camera then won't operate.

9. When you remove the batteries, a built-in memory battery holds the frame count in memory. If the frame-count LCD remains blank when you reinstall the batteries, the memory battery may be defective.

10. For intentional double exposures, simultaneously depress both the mode and metering buttons (top cover, rewind end). The external LCD shows ME (multiple exposures). The frame counter changes to "1." Now turn the dial switch to set the number of exposures you want to make on 1 frame (9 maximum). When you release the shutter, the ME flashes and the counter counts down 1 number. The film doesn't advance until you shoot the preset number of exposures. The ME LCD then turns off, and the frame counter returns to normal.

11. The stop-down lever (front, near bottom on rewind side) stops down the diaphragm to the selected aperture. Push the stop-down lever toward the lens; the stop-down lever latches in the stopped-down position.
If the lens is set to A, the shutter won't release in stopped-down mode. The external LCD shows EEE. When you push the release button part way, the finder LEDs show EEEE EE. With the lens at a manual-aperture setting, the external LCD shows an iris symbol; the finder LEDs show only the shutter-speed setting in program mode. On auto modes, the camera will automatically set the shutter speed to go with the stopped-down aperture.

Again push the stop-down lever toward the lens to reopen the diaphragm and restore normal operation. The stop-down lever returns to the disengaged position.

12. Simultaneously depress both the ISO button and the EXP COMP button to set the safety shift. When you turn the dial switch, SS appears on the external LCD. The safety shift overrides a manual shutter-speed setting if that speed would result in an incorrect exposure.

Exposure modes:
1. Set the exposure mode by holding down the mode button (top, rewind end) and then turning the dial switch. All LCDs except the mode LCD (and M if you're set to manual f/stop) turn off when you depress the mode button. Exposure modes:

PROGRAM. The LCD displays *Program*, Fig. 2. Set the lens to A. The camera then controls the aperture and the shutter speed according to normal program. When you push the release button part way, the finder LEDs show the shutter speed and aperture.

P. In the P mode, you can change the program to fit the lens and shooting conditions. By turning the dial switch in one direction, you can choose among the 3 tele programs -- *P-1, P-2, and P-3.* Turning the dial switch in the other direction allows you to select 1 of 3 wide programs. The 3 tele programs provide faster shutter speeds and larger apertures than the 3 wide programs. The aperture gets larger as you go from tele program P-1 to P-3. On the wide programs, you get smaller apertures and slower shutter speeds. The aperture gets smaller as you go from wide program P-1 to P-3.

TV. Set the shutter speed manually by turning the dial switch. The external LCD always shows the manually selected speed (unless you turn off the main switch). When you push the release button part way, the finder LED display shows the manually selected shutter speed and the f/stop that will be automatically selected.

Note: For full manual control, set the exposure mode to TV and set the lens to a manual f/stop. The LCD shows M. The finder LED display shows M, the manually set shutter speed, and the aperture you should set for proper exposure.

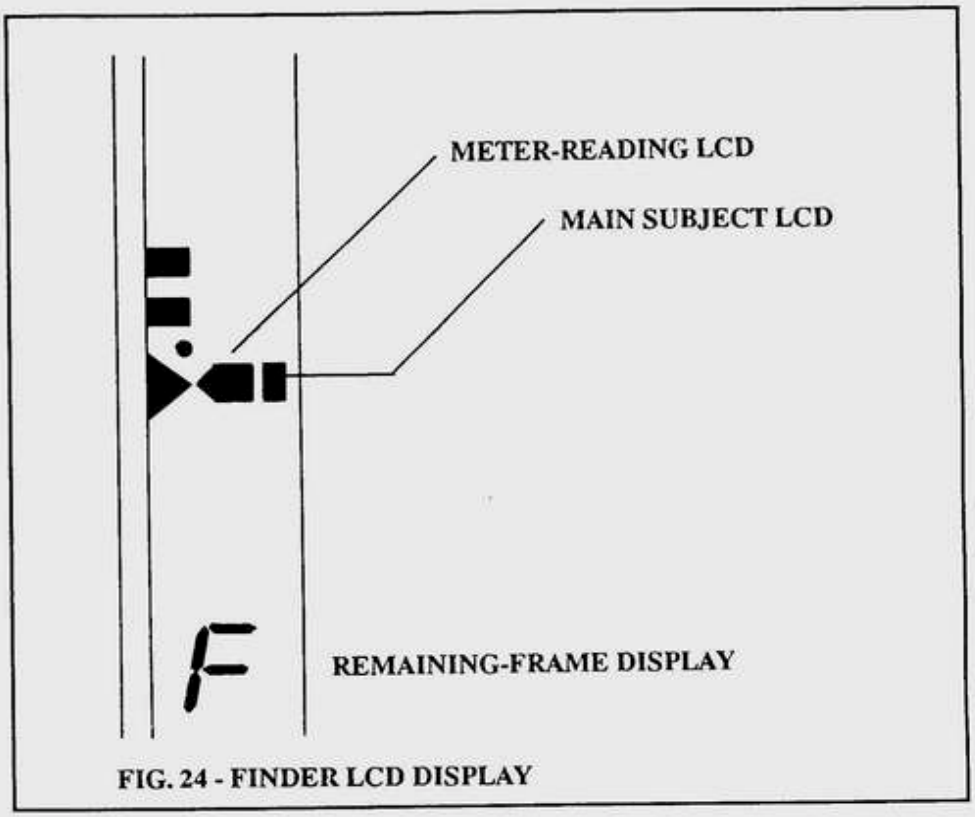


FIG. 24 - FINDER LCD DISPLAY

AV. Set the aperture manually (lens at A) by turning the dial switch. The external LCD always shows the manually selected f/stop. The finder LED display shows the manually selected aperture and the shutter speed that will be automatically selected.

BULB. Set the f/stop manually (on A, the diaphragm will always stop down fully). As you hold open the shutter on bulb, the frame counter changes to an elapsed-time counter.

Drive modes:
1. Set the drive mode by pushing the drive-mode button, Fig. 17. With the drive-mode lever in the S-C position, pushing the button moves the LCD arrow to row to *SINGLE*, Fig. 6, *H*, or *L*. At *L*, the camera operates in low-speed continuous -- the camera releases and charges as long as you hold the release button depressed at a maximum 2fps. At *H*, the camera operates at a maximum speed of 4.5fps. At *SINGLE*, the camera still operates in high-speed wind. However, you must let up and again depress the release button to make another exposure.

Note: The charge motor operates in the high-speed mode at both *SINGLE* and *H*. However, the camera has a safety feature that switches the operation to low speed if the load from the diaphragm is too great (long lenses or off-brand lenses) or if the batteries are low. If you're operating the camera on high-speed continuous, may switch automatically to low-speed continuous. The LCD drive-mode arrow then flickers. You can reset to high-speed continuous by again pushing the drive-mode button. A heavy load from the diaphragm may also cause the camera to switch to low speed on *SINGLE*. The LCD drive-mode arrow flickers, and the camera operates on low speed. Reset to high speed by pushing the drive-mode button.

Excessive diaphragm load may also cause the camera to switch to the **error condition**. The external LCD shows **EEE**, the finder LED shows **HELP**, and the camera won't operate. Clear the error condition by removing and replacing the battery pack.

2. For self-timer, move the drive-mode lever to the clock symbol, Fig. 17. Pushing the drive-mode

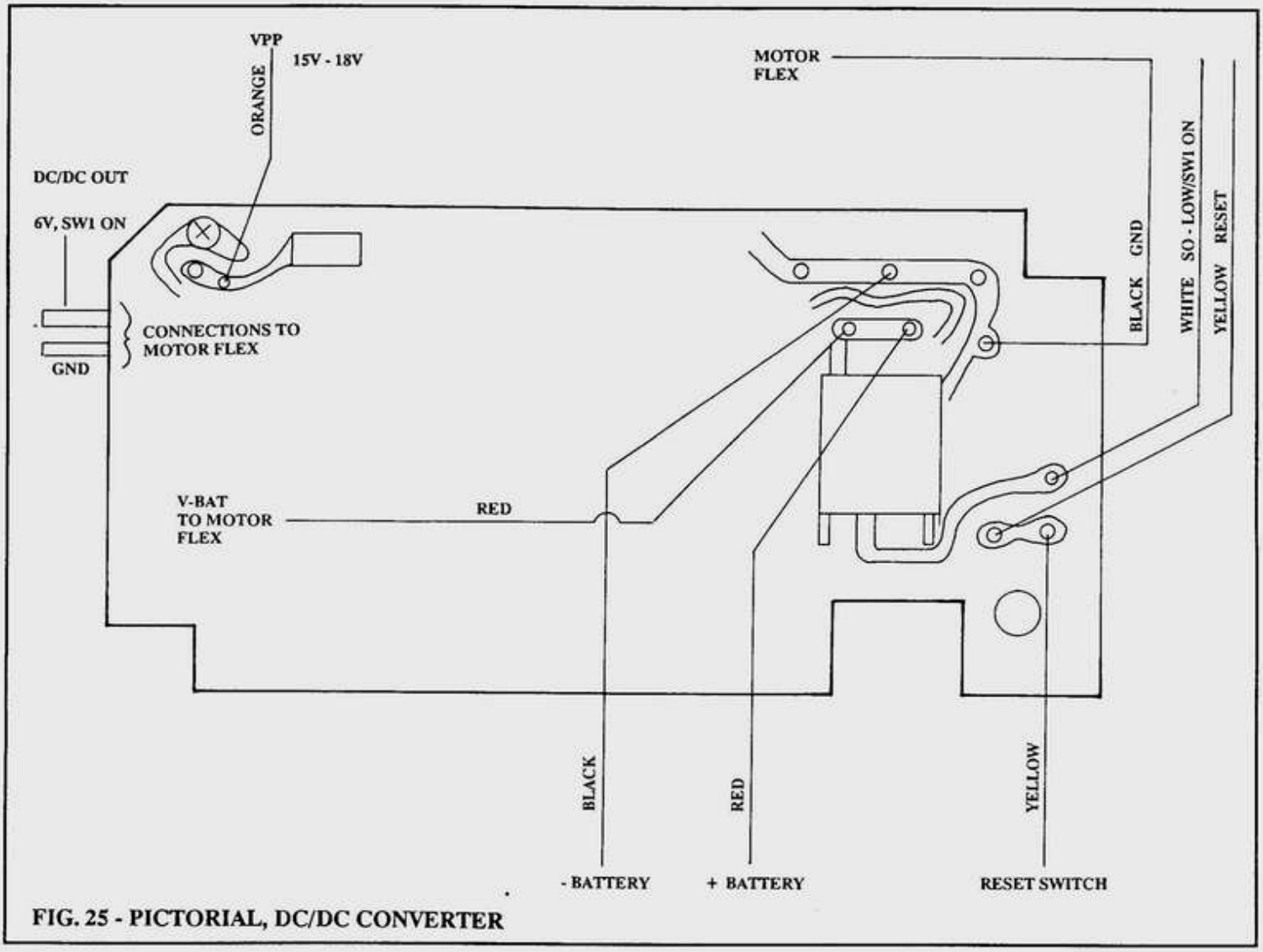


FIG. 25 - PICTORIAL, DC/DC CONVERTER

button now moves the LCD arrow to 2 (2-second self-timer) or 10 (10-second self-timer). When you push the release button, the LCD frame counter switches to either "10" or "2" (according to the self-timer-delay setting). The frame counter then counts down during the delay. The self LED at the front of the camera flickers during the delay; the frequency increases 2 seconds before the release.

3. You can clear the self-timer by depressing the BC button or by moving the drive-mode lever to the S-C setting. After the shutter release on self-timer, the charge motor operates at low speed.

Note: The self-timer will not operate at the bulb-mode setting.

Set an exposure compensation by pushing the EXP COMP button at the back of the camera (bottom). The ISO LCD and the exposure-compensation scale turn on. Turning the dial switch then moves the cursor along the exposure-compensation scale to select over or underexposure. If you've set an exposure compensation, the exposure-compensation scale remains on. Also, a +/- LED turns on in the finder when you push the release button part way. To clear the exposure-compensation setting, depress the EXP COMP button and set the index to "1" on the scale.

Metering modes:

1. Depress the metering button (top cover, rewind end) and turn the dial switch to change the metering mode. With nothing showing within the metering-mode rectangle, the camera is in the averaging mode (normal center-weighted mode).

2. The circle in the metering-mode rectangle, Fig. 6. indicates partial metering and AE lock. The camera meters only on the large circle at the center of the focusing screen (13% of screen). Also, the exposure remains locked as long as you keep the release button partially depressed. An asterisk shows at the left-hand side of the finder LED display.

3. The black dot in the metering-mode rectangle, Fig. 2, indicates spot metering (2.7% of screen) and AE lock. When you push the release button part way, the finder LCD turns on showing a scale and an index. The exposure remains locked as long as you keep the release button partially depressed.

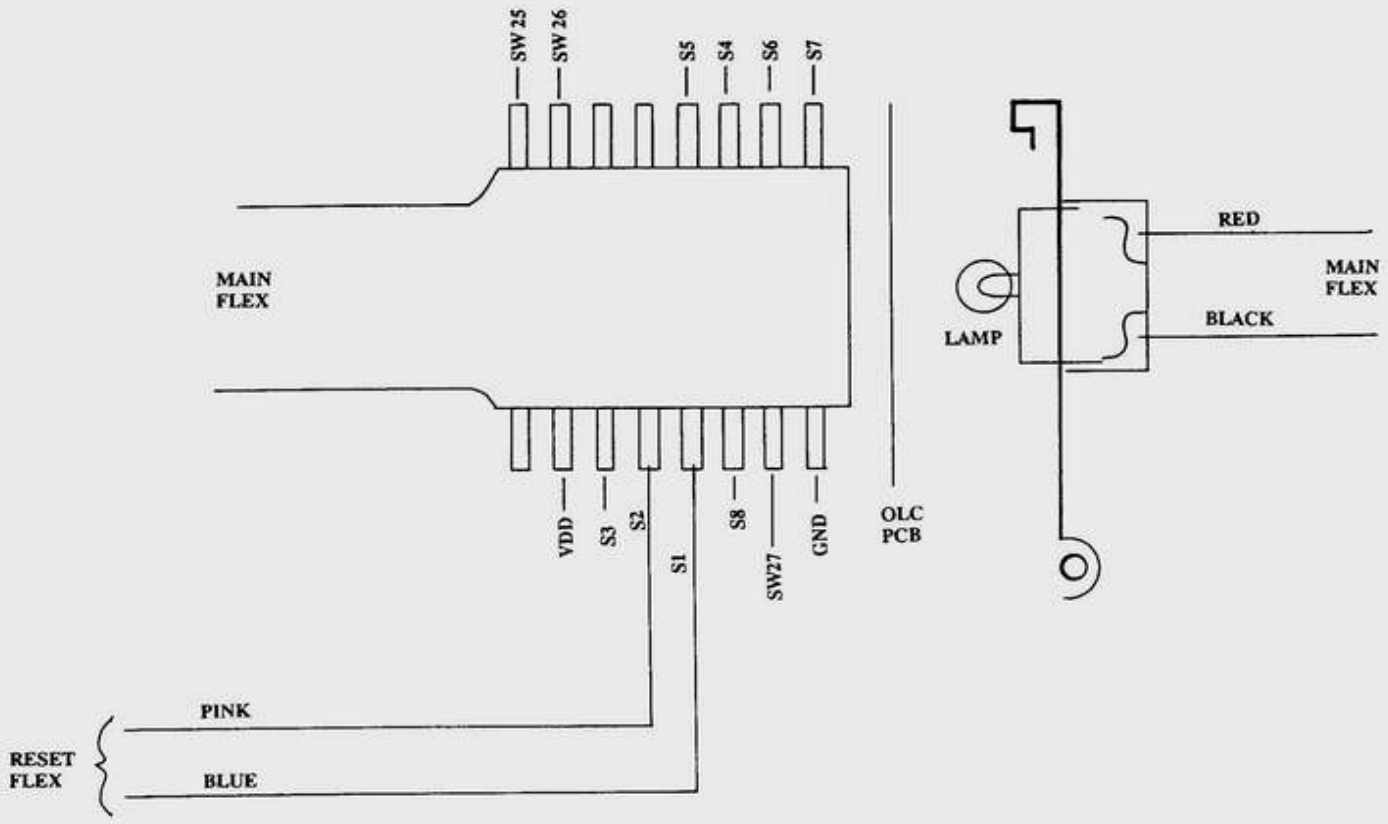


FIG. 26 - PICTORIAL, UNDERSIDE OF EXTERNAL LCD (CONNECTIONS BETWEEN MAIN FLEX AND OLC PCB)

However, the index on the LCD scale moves as light conditions change. You can move the index up or down by pushing the up and down buttons, back of top cover. The exposure changes as you move the index.

Flash operation

1. The dedicated flash automatically sets the flash speed between 1/60 and 1/250. The flash-mode indicator, Fig. 23, turns on to indicate that the flash is ready. On manual, you can use any of the speeds slower than 1/250.

2. The 300TL flash, designed for use with the T90, allows you to select either 1st-curtain or 2nd-curtain sync (select with a button at the back of the flash unit).

3. In the FEL mode (flash-exposure lock), the 300TL provides a preflash when you push the spot-metering button, Fig. 2. The exposure is then locked in, and you can reframe the subject. Also, you can independently control the available-light exposure. The finder LCD shows the exposure of the main subject (flash) and the camera's meter reading, Fig. 24. By using the highlight and shadow buttons, you can control the amount of exposure to the background.

DISASSEMBLY HIGHLIGHTS

Sequence to remove covers:

1. remove 3 front-cover screws (1 at front top, 2 at bottom)
2. loosen 2 screws holding hook (back-latch) cover (around 2 turns) -- slightly separate hook cover from body to free hooks on front cover
3. lift off front cover
4. remove 5 top-cover screws (2 at front, 1 at top by strap lug, 2 at back)
5. remove eyepiece lever, back of top cover (cemented cap, screw)
6. lift off top cover (wires still attached)
7. remove 2 buttons, top rewind end
8. unsolder top-cover wires from flex, Fig. 1 --

- **green, purple, orange,** and **gray** (hot shoe) from main flex, lower section at top of camera
- **blue, pink, black,** and **white** (top-cover switches) from main flex, upper section at top of camera
- 2 leads of **shielded X-sync cable** from shutter flex

Sequence to remove battery case:

Note: You can remove the mirror box to replace the shutter or curtains without removing the battery case.

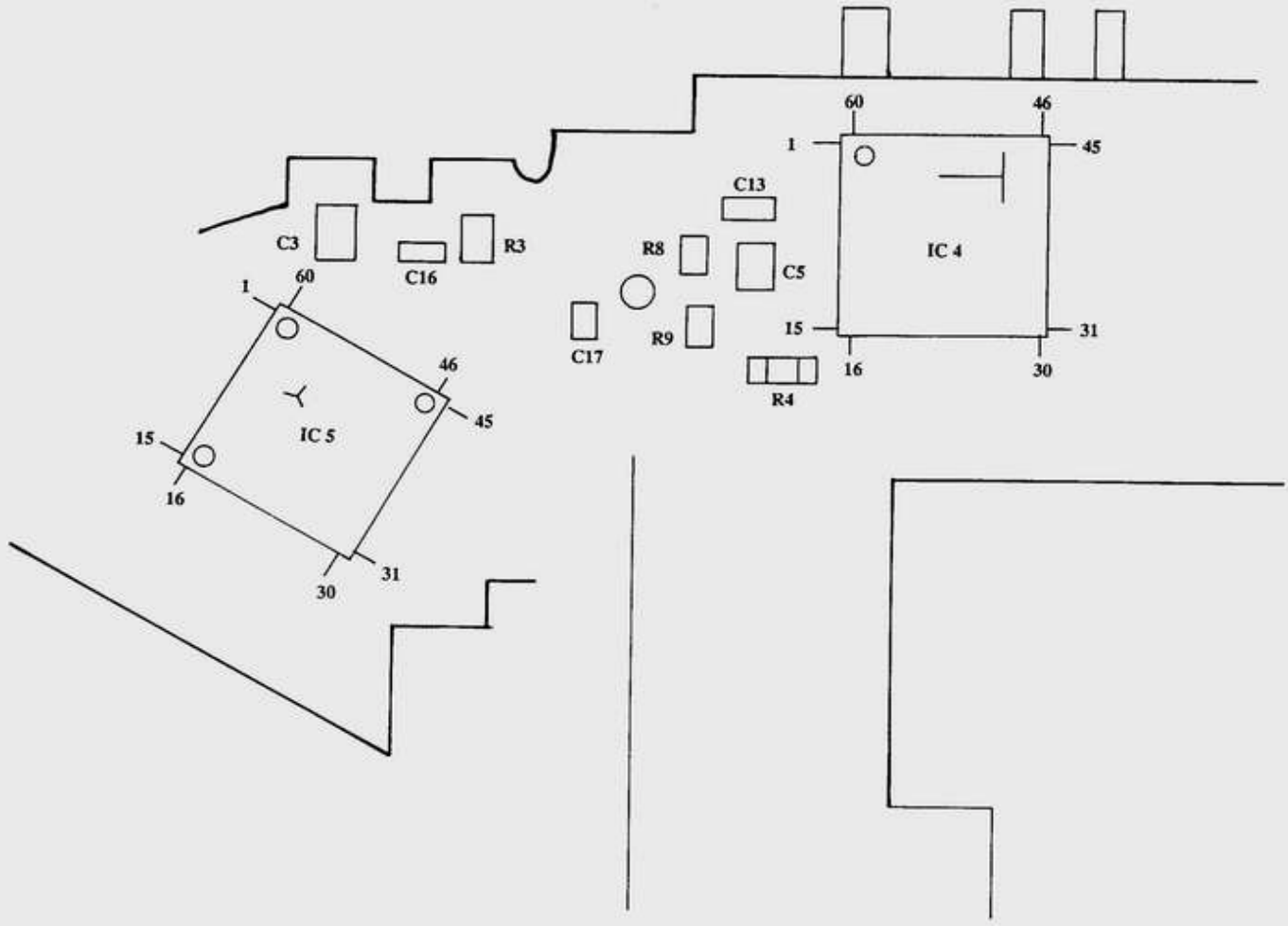


FIG. 27 - IC4 AND IC5 PIN NUMBERING

1. remove rubber, bottom of camera (2 brass hole covers stay with rubber -- the covers go over the 2 screw-access holes in the battery case)
2. remove 2 screws accessible through clearance holes near tripod socket, bottom of battery case -- long screw goes toward front of camera
3. remove 4 battery-case screws -- 2 at each end (white machine screw goes at rewind end toward front of camera)
4. unscrew retaining ring around tripod socket
5. lift the bottom of the grip rubber to free the battery case
6. lift off battery case (wires still attached)
7. remove loose compression spring, lower end of palm-wing rod (short spring -- a long compression spring goes over the upper end of the palm-wing rod)
8. unsolder battery-case wires from MD flex at bottom of camera

Note: If you want to use the battery case to power the camera, leave the red, black, and yellow wires attached. To power the camera with a power supply, connect hook-up wires to the lands for the red (+) and black wires. Connect 6V between the hook-up wires. Momentarily short the yellow reset-switch wire, Fig. 28, to ground to reset the circuit. The external LCD should turn on when you remove the short, and the camera should operate.

9. remove tripod socket (4 screws)

Reassembly highlights:
When you replace the front cover, make sure the front-cover stop-down slide (lower front, rewind side) is all the way to your right (looking at the front of the camera). The stop-down slide must couple to the fork in the stop-down lever, Fig. 4.

Seat the left-hand end (release-button end) of the front cover first; then lower the front cover into place. Check the operation of the stop-down slide. Push the stop-down slide toward the lens; the stop-down slide should latch in the stopped-down position. Again push the stop-down slide toward the lens; the stop-down slide should release and return to the normal position.

Sequence to remove mirror box, shutter block:
1. disconnect gray wire from solder lug, front release side of mirror box,

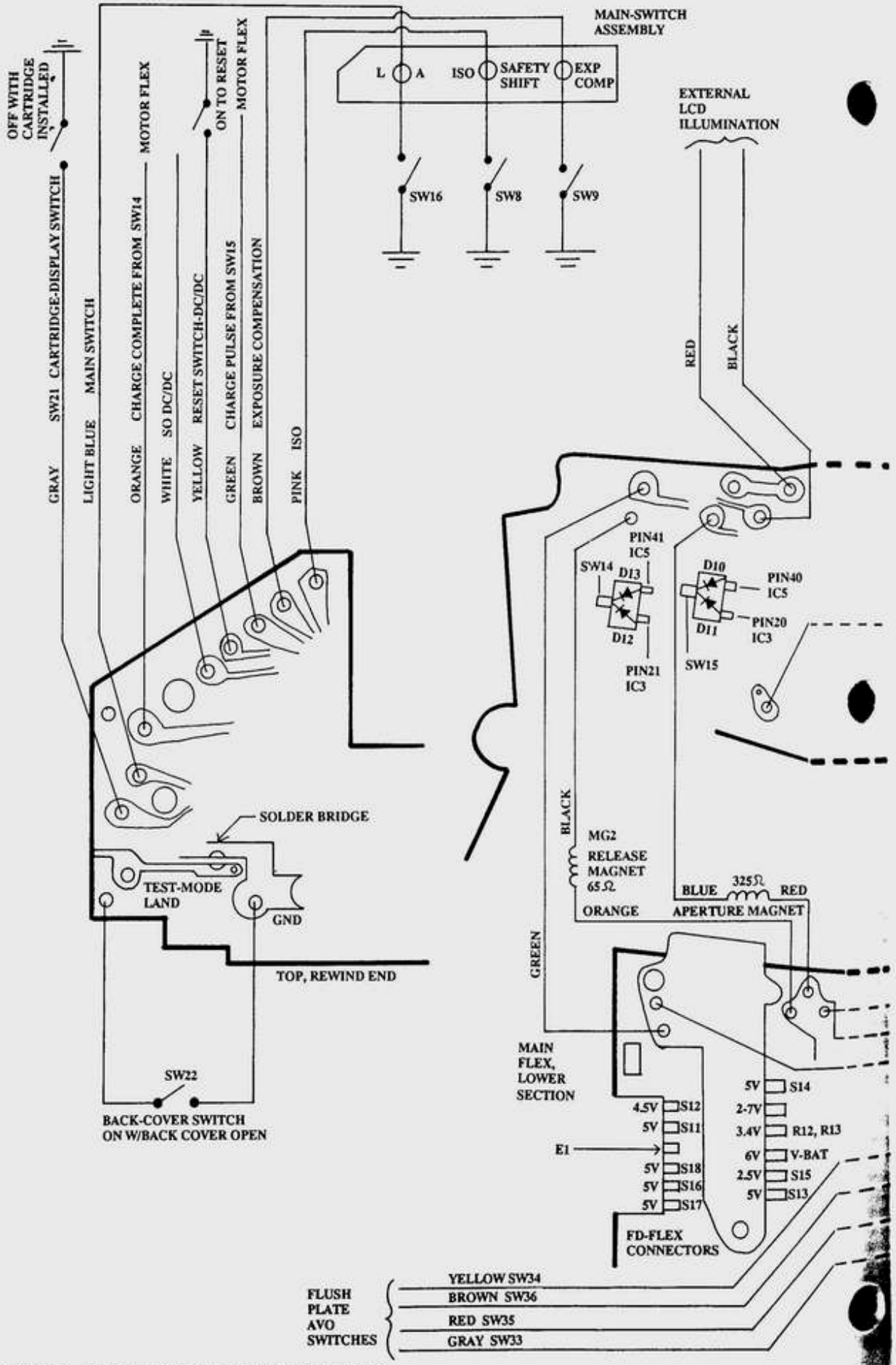


FIG. 28 - PICTORIAL, TOP OF MAIN FLEX

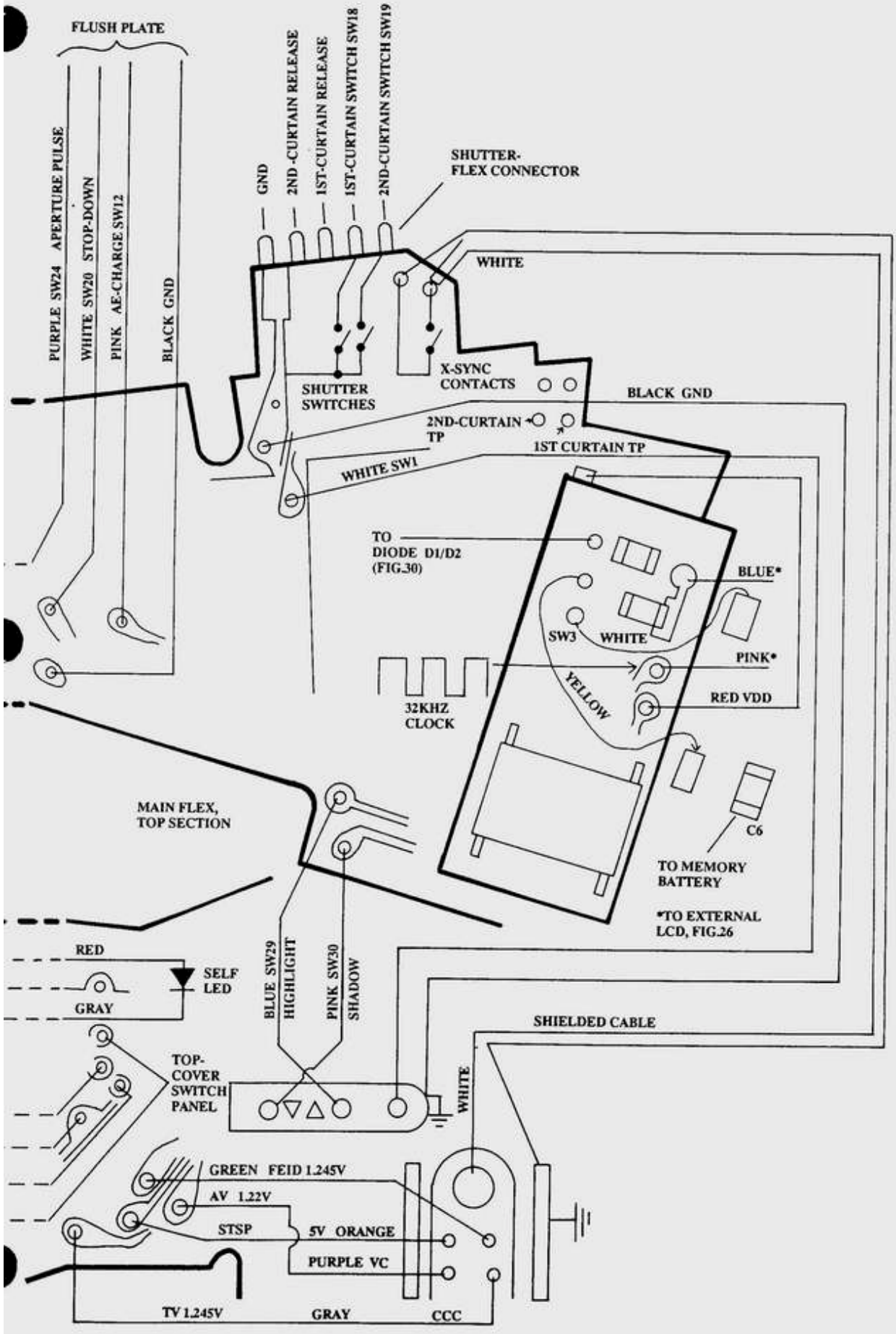

FLUSH PLATE
PURPLE SW24 APERTURE PULSE
WHITE SW20 STOP-DOWN
PINK AE-CHARGE SW12
BLACK GND
GND
2ND-CURTAIN RELEASE
1ST-CURTAIN RELEASE
1ST-CURTAIN SWITCH SW18
2ND-CURTAIN SWITCH SW19
SHUTTER-
FLEX CONNECTOR
WHITE
X-SYNC
CONTACTS
SHUTTER
SWITCHES
BLACK GND
2ND-CURTAIN
TP
1ST CURTAIN TP
WHITE SW1
TO
DIODE D1/D2
(FIG.30)
BLUE*
SW3
WHITE
PINK*
YELLOW
RED VDD
32KHZ
CLOCK
C6
TO MEMORY
BATTERY
*TO EXTERNAL
LCD, FIG.26
MAIN FLEX,
TOP SECTION
RED
SELF
LED
GRAY
BLUE SW29
HIGHLIGHT
PINK SW30
SHADOW
SHIELDED CABLE
TOP-
COVER
SWITCH
PANEL
WHITE
GREEN FEID 1.245V
AV 1.22V
STSP
5V ORANGE
PURPLE VC
TV 1.245V
GRAY
CCC

Fig. 4 (or remove screw holding solder lug)
2. unsolder wires, front release side of main flex, Fig. 4

Note: Fig. 29 shows the wire positions to the front of the main flex (upper right-hand corner of drawing).

3. unsolder red and gray wires from self LED, Fig. 4.
4.. remove pressure bar, front flex connector (2 screws), Fig. 4
5. separate top flex section (SP flex) from flex-connector pins
6. remove elastic connector that fits over flex-connector pins
7. desolder main flex from V-BAT pin, front, Fig. 29
8. separate main flex from flex-connector pins
9. remove elastic connector that fits over flex-connector pins
10. unsolder wires, top rewind end, Fig. 28
11. remove switch rubber, top rewind end (large shoulder screw)
12. remove flex screw, top rewind end
13. desolder 2 connections of back-cover switch from main flex, top rewind end
14. separate top rewind end of main flex from camera
15. lift out mode-switch (plastic support) plate, top rewind end
16. desolder DX flex from FD flex, top rewind end (9 connections)
17. desolder FD flex from back-cover switch contact, top rewind end
18. remove eyelens, 2 long screws top
19. remove 3 screws holding external LCD (white screw goes at release end, toward back of camera)
20. unsolder black and red LCD-illuminator wires, top of main flex
21. unfold section of flex with external LCD
22. unsolder black, yellow, and blue sprocket-switch wires from main flex
23. desolder 5 connections of shutter flex from main flex

Note: In early versions of the flex, only the top 3 connections solder directly to the shutter flex. Wires connect the 1st-curtain and 2nd-curtain switch contacts on the shutter flex to the switch-test points on the main flex, Fig. 28 (brown wire for 1st-curtain switch, white wire for 2nd-curtain switch). On disassembly, unsolder the wires from the shutter flex.

24. disconnect and remove stop-down spring, bottom of mirror box
25. remove 2 black mirror-box screws, back by eyelens
26. remove 2 locating screws, front bottom of mirror box
27. lift out mirror box together with main flex
28. remove 2 screws holding plastic support plate, Fig. 10
29. unsolder orange wire from front of shutter block, Fig. 10
30. remove 3 screws holding shutter block (top 2 corners, bottom left-hand corner)
31. lift out shutter block

Note: To charge the mirror box, push forward the charge lever, Fig. 11. Release the mirror by pushing the armature of the release magnet, Fig. 11, away from the core (or push the tab, Fig. 11, toward the front of the mirror box). To return the mirror, disengage the mirror-up latch, Fig. 13. For mechanical operation and troubleshooting of the shutter block, see *TROUBLESHOOTING (Testing the shutter block).*

Sequence to replace shutter curtains:
1. remove shutter block
2. release shutter
3. remove rear cover plate (slide to disconnect holes from posts)
4. remove 1st-curtain booster spring, Fig. 16
5. remove blade spacer (fits over 2 posts, left-hand side)
6. remove brass washers over posts on left-hand side (thick washer on bottom post, thin washer on top post)
7. remove 1st-curtain assembly
8. remove rubber washer, lower right-hand post
9. remove blade separator (plate that goes between 2 curtains)
10. lift out 2nd-curtain assembly (slide to left to disconnect from booster spring)

Note: The 2nd blade spacer fits over the 2 posts, left-hand side. Another pair of washers fits above the blade spacer -- thick washer goes over the top post, and the thin washer goes over the bottom post.

Reassembly highlights, curtains:
1. Seat the 2nd-curtain booster spring over the post for the 2nd-curtain arm.
2. Seat the 2nd curtain (unfolded, covering aperture). Reach under the 2nd-curtain arm and hook the booster spring to the top of the 2nd-curtain arm.
3. Replace the blade spacer.
4. Replace the rubber washer over the post in the lower right-hand corner.
5. Replace the 2 brass washers over the left-corner posts -- thick washer on bottom post.
6. Replace the 1st-curtain assembly (folded, top of aperture).
7. Replace the blade spacer over the posts at the left-hand corners.
8. Seat the 1st-curtain booster spring.
9. Replace the rear cover plate.

Reassembly highlights, shutter and mirror box:
1. As a precaution to prevent curtain damage, install the shutter in the open position (charge, then release 1st curtain).

Note: For operation of the shutter block, see, *TROUBLESHOOTING* (Testing the shutter block).

Make sure the mirror-charge lever in the camera body is in the start position (all the way to the back of the camera). If not, you can apply around 2V to the charge motor. While the charge motor is running, lightly push the mirror-charge lever toward the back of the camera body. When the mirror-charge lever moves to the start position, disconnect power from the charge motor.

2. Seat the shutter block and replace the 3 screws. Mechanically release the 1st curtain. Then check operation by applying around 3V directly across the charge motor, Fig. 9. The charge motor should run and charge the shutter.

Note: The polarity of the voltage across the charge motor only determines the speed of the charge operation. With + on the connection closer to the end of the

camera, Fig. 9, the charge mechanism operates on low speed. With + on the connection closer to the center of the camera, the charge motor reverses rotation, and the gearing at the bottom of the camera shifts to high-speed operation.

3. As the charge motor is running, check the overtravel of the shutter charge -- watch the 2nd-curtain latch at the top of the shutter block, Fig. 9. You can see the 2nd-curtain latch move in and out of engagement as the charge motor charges the shutter slightly beyond the latching point. The 2nd-curtain latch should move 0.2mm beyond the latching point before dropping into engagement.

Note: To adjust the shutter-charge overtravel, it's necessary to change the roller (adjusting collar CA1-6441-000) on the shutter-charge 2 lever (Q in Fig. 19). Increase the overtravel by using a roller with a larger diameter. See *Adjustment Values* for the different diameters available.

4. Again make sure the mirror-charge lever, Fig. 10, is all the way to the back of the camera (it may be necessary to run the charge motor until the mirror-charge lever drops back. Then install the mirror box and replace the 4 screws (shoulder screws first). The mirror box can be either charged or released.
5. Check the mirror operation by first disconnecting the orange release-magnet wire, top rewind side of flex, Fig. 28. If the mirror is charged, apply 2 - 3V across the release magnet -- + to orange, - to black. The mirror should release and stay in the raised position (if the mirror isn't charged, run the charge motor until the mirror-charge lever moves fully forward and then drops back).
6. With the mirror up, again apply voltage across the charge motor. The mirror should return, and the shutter should charge.

Sequence to remove grip:
1. unsolder release-block wires, bottom of motor flex (pink, yellow, black, red, white, blue), Fig. 29
2. free wires from slot in routing plate, Fig. 3
3. remove grip rubber
4. remove 3 screws holding release-switch block, Fig. 4
5. lift out release-switch block (toward top) -- note loose compression spring on top of palm-wing rod)
6. remove back cover
7. remove back-cover hinge plate (2 screws), Fig. 17
8. disconnect palm-wing spring from slot in switch panel, Fig. 17

Note: If you want to completely remove the palm wing, pull out the rod toward the top of the camera. The spring will be loose.

9. remove switch panel (2 screws), Fig. 17
10. remove 3 screws holding grip -- 2 at top and 1 at bottom
11. slide grip toward top of camera (remove grip together with palm wing)

Sequence to remove charge motor:
1. remove grip
2. remove plastic routing plate, Fig. 3 (1 screw)
3. unsolder 2 connections of MD flex to charge motor, Fig. 9
4. remove charge motor -- 2 screws, bottom (reach 1 through cutout in sun-gear assembly)

Reassembly highlights:
Key the dimple on the bottom of the charge motor to the locating pin on the base plate.

Sequence to remove motor flex:
1. remove grip (it isn't necessary to remove the charge motor)
2. remove 2 screws holding data-back contact block, Fig. 17
3. unsolder red and black M1 wires from top of MD flex, Fig. 9
4. unsolder red and black power wires, front of MD flex, Fig. 10
5. unsolder front of MD flex from pin on plastic support, Fig. 10
6. free MD flex from release end of body
7. unsolder wires, bottom of MD flex, Fig. 29
8. remove screw, bottom of motor flex (note washer under screw)

Note: Early cameras have 2 screws and washers holding the motor flex.

9. slide out motor flex toward release end of camera

Sequence to disassemble charge gears, remove wind motor:
Note: You don't have to completely remove the motor flex. Free the release end of the motor flex and unsolder the SW14/SW15 wires and the remote-release wires. Remove the flex screw. Then lift aside the motor flex to reach the bottom plate, Fig. 19.

1. remove sun-gear assembly, Fig. 19 (E-clip)
2. remove 2 charge gears under sun-gear assembly, Fig. 20 (E-clips)
3. remove bottom plate, Fig. 19 (2 screws)
4. remove shutter-charge 1 lever, Fig. 20 (loose roller on post, underside of shutter-charge lever)
5. remove mirror-charge lever, Fig. 20
6. remove charge-cam gear, Fig. 20
7. remove charge-mechanism base plate, Fig. 21 (4 screws -- the large screw goes to the back and end of the camera, the small screws go near the switch board)
8. lift out the coil spring, Fig. 22 (sits on top of winding-9 gear)
9. lift out gears, Fig. 22

Note: The winding-9 gear also has a slip spring on the underside. The end of the slip spring hooks against the lug on the winding-mechanism base plate.

10. remove sprocket-shaft screw, Fig. 9
11. lift out winding-mechanism base plate (including wind motor) from bottom of camera
12. unscrew wind motor (upper end threads into mechanism-plate bearing) -- loose winding-10 gear and washer at pinion end of wind motor

Reassembly highlights:
1. Twist together the red and black wind-motor wires. As you seat the wind-motor assembly, pass the wire pair through the hole at the top of the camera.

2. Lubricate the shafts of the gears with grease.

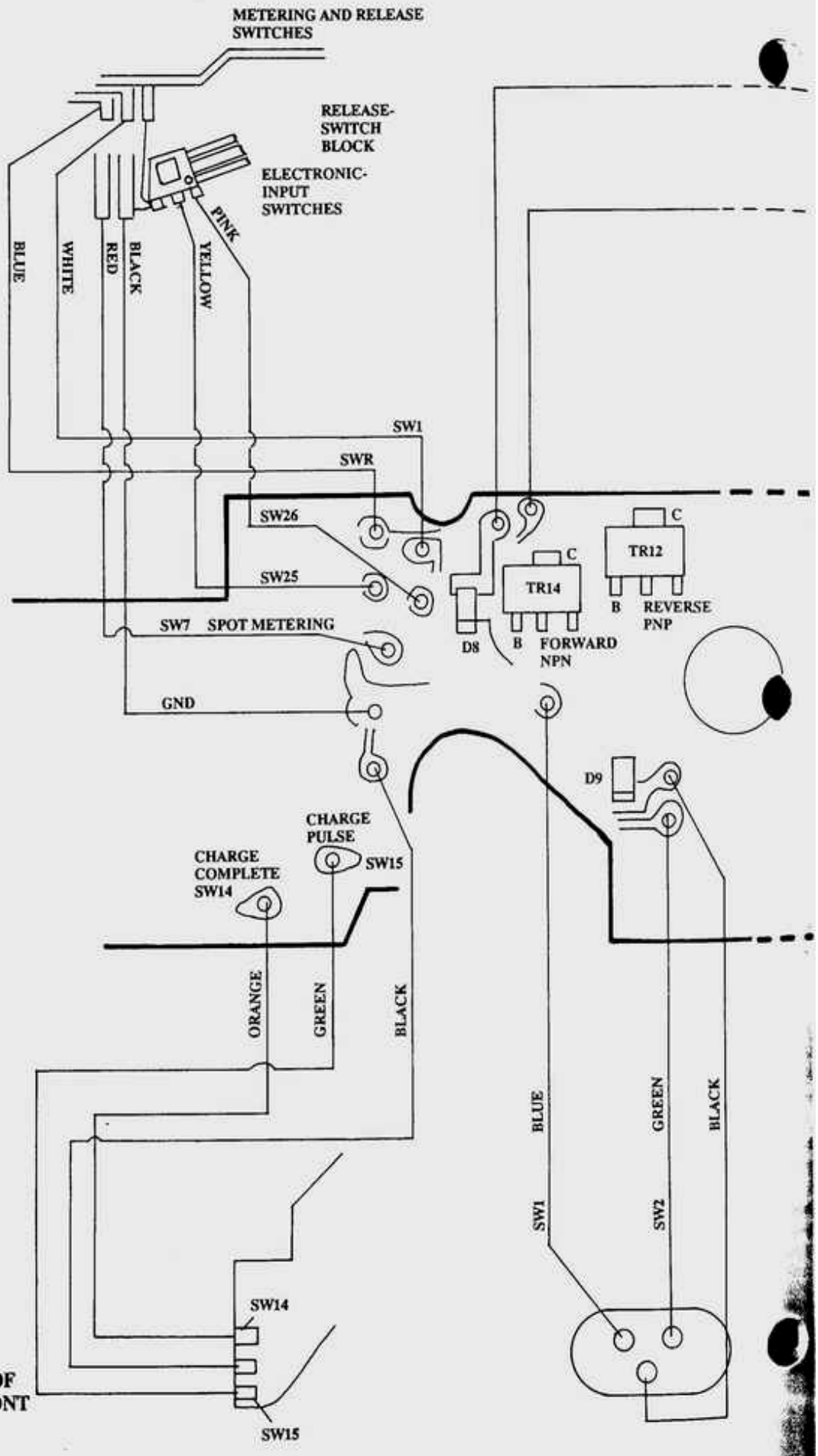
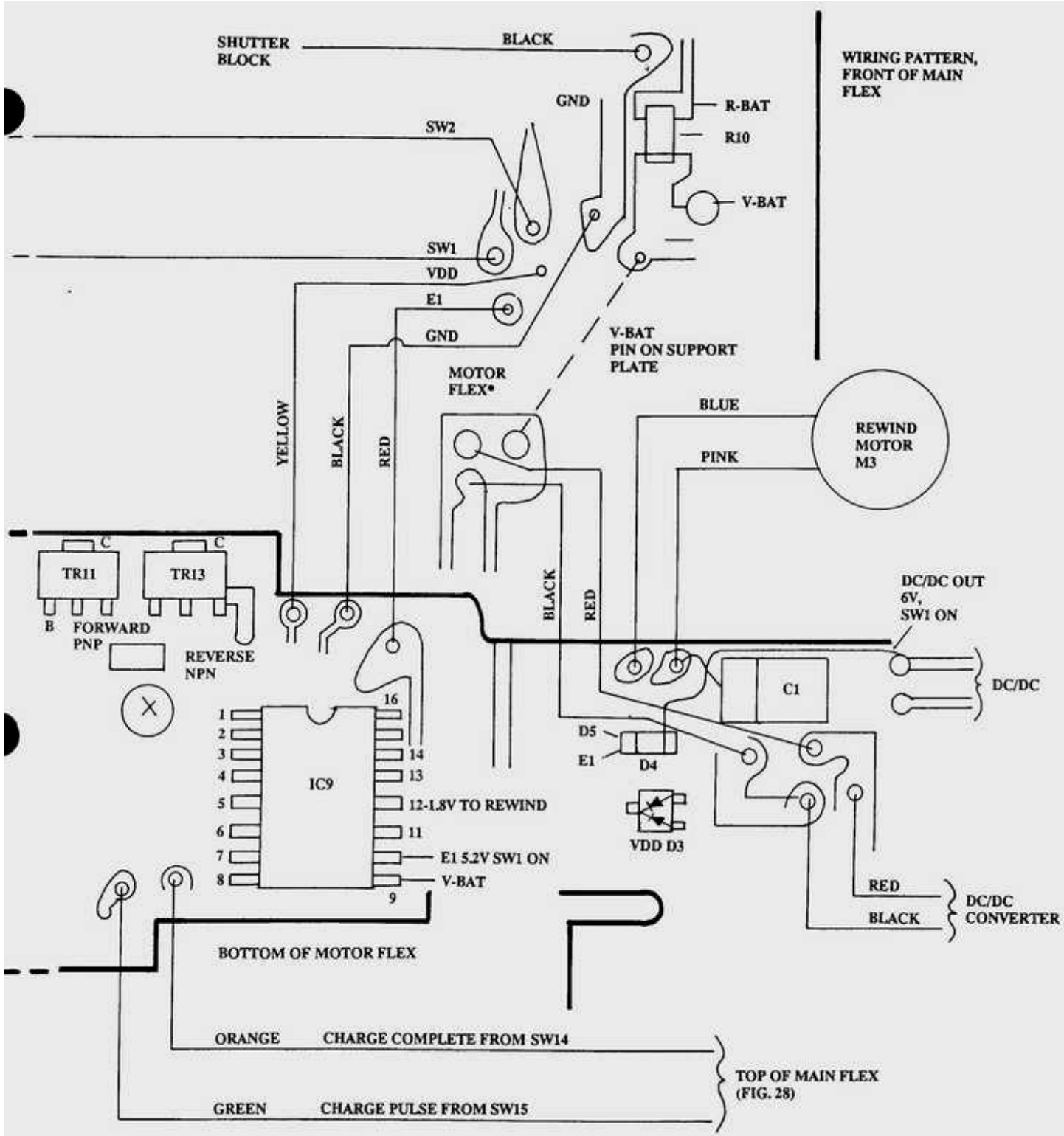


FIG. 29 - PICTORIAL, BOTTOM OF MOTOR FLEX AND FRONT OF MAIN FLEX



* FRONT SECTION OF MOTOR FLEX THAT CONNECTS TO SUPPORT PLATE

3. After seating the gears, you can check operation by applying around 3V across the wind-motor wires. With + on the red wire, the wind motor should run in the forward direction at low speed -- both the spool and the sprocket should turn. With + on the black wire, the wind motor should run in the reverse direction at high speed -- only the spool should turn.

Other disassembly notes:
1. To disassemble the sprocket switches (wind-complete switch and film-winding switch), Fig. 9, remove the sprocket-shaft screw and the 2 black screws. You can then lift off the cover plate. The upper sprocket gear and the switch gear must be timed on reassembly. The switch gear has a bar molded on the top side. Align the bar with the timing punch mark on top of the upper sprocket gear (note that the upper sprocket gear has 3 ridges on the top side -- the timing punch mark is in the center of one of these ridges).

2. To remove the auto-diaphragm unit, Fig. 11, remove the cemented indicator plate at the bottom front of the mirror box (the plate with the red dot next to the diaphragm-closing lever). Take out the 3 screws holding the auto-diaphragm unit (1 long screw, 2 countersunk screws). You can then lift off the auto-diaphragm unit with the release magnet and reach the SP flex and the aperture magnet. To remove the AE unit, Fig. 12, first take out the AE-brush guard (screw at front, under wires). Then remove the 2 screws holding the AE unit.

3. To remove the FD flex, take off the pentaprism frame or the AE unit to reach the 2 screws holding the finder-LCD block, Fig. 12 (underside of bracket on pentaprism frame).

Note: If you remove the pentaprism frame with the pentaprism, watch for the loose spacers under the pentaprism frame -- 2 oval-shaped spacers on the rewind side, 1 rectangular spacer on the release side.

Remove the 2 nuts holding the LED display; free the LED display from the posts at the back of the pentaprism frame. Remove the 2 screws from the bottom of the pentaprism frame and slip the finder-LCD block out of the bracket.

To reach the finder LCD, remove the screw on the prism side of the finder-LCD block. The screw holds together the 2 plates of the LCD holder (the 2nd plate fits within the light-guide prism on the other side of the finder-LCD holder). Lift off the metal plate on the prism side of the finder-LCD block. Then remove the clip at the bottom of the finder-LCD block and lift off the information prism, the finder LCD, and the pressure connector.

Separate the FD flex from the finder-LCD block by removing the 2nd plate of the LCD holder. Then lift out the light-guide prism together with the FD flex.

4. To replace the main flex, follow the steps in *Sequence to remove mirror box*. Also, unsolder the FD-flex connectors, Fig. 28, and the remaining wires. The external LCD is not supplied with the replacement main flex -- unsolder the main flex from the underside of the external LCD, Fig. 8. To separate IC1 from the eyepiece-shutter assembly, disconnect and remove the spring (between the IC1-adjustment plate and the eyepiece-shutter assembly). Then slide the plate with IC1 to the left in Fig. 7; the plate has 2 slots that fit over the lipped posts on the eyepiece-shutter assembly.

REVISED SECTIONS
1. Main flex. In the early version, only the top 3 connections solder directly to the shutter flex, Fig. 28. The flex is cut after the 3rd connection from the top. Wires connect the 2 curtain-switch tabs on the shutter flex to the main flex -- a brown wire connects the tab for the 1st-curtain switch to the 1st-curtain TP, and a white wire connects the tab for the 2nd-curtain switch to the 2nd-curtain TP, Fig. 28. Inte rchangeable.

2. Switch panel assembly, Fig. 17. The material has been improved. In early versions, the plastic strap lug breaks easily.

3. The rewind motor runs until the film leader has been completely rewound into the cartridge. However, you can revise the rewind-timing circuit to leave a portion of the leader extending from the cartridge. Bridge the 2 film-leader lands, Fig. 5, with solder.

4. The owner may want a PC terminal installed (the camera only provides hot-shoe flash). There's room for a PC terminal on the rewind side of the top-cover pentaprism hump. Connect the PC-terminal wires to the shielded-cable wires, Fig. 28, or directly to the hot shoe. The flash will fire when the 1st curtain crosses the aperture
(1st-curtain sync).

TROUBLESHOOTING
Behavior without batteries: shutter won't release
Behavior without film: no rewind, no auto load, spool and sprocket don't turn after exposure
Typical current draw (6V supplied):
- leakage (main switch off) -- 7 microamps
- main switch on (LCD on) -- 430 microamps
- SW1 on (LCD illuminator on) -- 190ma
- during auto load -- 350ma
- during film advance after exposure -- 650 - 700ma
- during rewind -- 650ma

Motor current with 6V applied directly to motors, mirror box removed:

M1 (6V applied across black and red wires, Fig. 9):
- high speed (only spool turns) -- 140ma
- low speed (sprocket and spool turn) -- 80ma

M2 (6V applied between charge-motor connections, Fig. 9):
- high speed -- 550ma
- low speed -- 320ma

M3 (6V applied between pink and blue wires, Fig. 29):
- forward (+ on pink) -- 170ma
- reverse (+ on blue) -- 150ma

Frequently repaired sections:
1. Camera switches to error condition (EEE, no operation) or switches from high-speed operation to low-speed operation with the drive-mode LCD arrow flashing. If the batteries are o.k., the problem is normally caused by the lens; if the diaphragm-operating ring isn't moving smoothly, it overloads the camera mechanism. Check to see if the customer is using an off-brand lens (usually a telephoto) with a heavy diaphragm action. Reset the camera by removing and reinstalling the battery pack. The problem may also be caused by a defective shutter block.

2. Shutter curtains damaged. You can replace the curtains individually.

3. Strap lug broken, release side. The strap lug has been improved. Replace the switch panel assembly, Fig. 17. Part # **CG9-2676-000.**

Tips for troubleshooting without disassembly:
1. If the finder LEDs won't turn on -- or turn on erratically -- check operation by pushing the preview switch at the back of the top cover (release end). If pushing the preview button does turn on the finder LEDs properly, the problem is in S1, the wiring to S1, or the ground wires in the release-switch block. If the LEDs still won't turn on, try setting the finder lever to a different position (dot or lamp). If the LEDs turn on at a different setting of the finder lever, the problem is in the finder-lever switch.

2. If the camera is in the error-detection mode (no operation, EEE showing on LCD), try resetting the circuit by removing and replacing the battery pack. Then operate the camera without the lens. If the camera operates properly, the problem is probably in the lens. If the camera returns to the error-detection mode, the shutter block may be defective.

3. If the shutter won't release, but the finder LEDs turn off and the drive-mode LCD arrow flickers when you fully depress the release button, check the release magnet. If the finder LEDs stay on, check the release switch and the connections in the release-switch block, Fig. 28. You can also check the release switch by shorting the ground and SW2 connections of the remote connector, Fig. 28; if the shutter then releases, the problem is in the release switch SW2 or the wiring to the release-switch block.

4. Check the film transport by opening the back cover and disengaging the back-cover latch. Then push in the cartridge detector, Fig. 7. The wind motor should run briefly in the reverse direction (sprocket doesn't turn). The wind motor should then run in the forward direction, turning the sprocket for the auto load. Finally, the wind motor should again run in the reverse direction, disengaging the sprocket, for 1 cycle.

5. If the external LCD won't show M with the lens removed or at auto, the problem is probably poor contact in the A/M switch SW17 or poor contact in the front flex connector between the SP flex (top section) and main flex. You can check at pin 24 of IC3, Fig. 30. Shorting pin 24 to ground should turn on the M LCD. If not, IC3 may be defective. If so, the problem is in SW17 or the flex connector (top layer).

6. Check the flash changeover by connecting a 3K resistor between the CCC hot-shoe contact, Fig. 28, and ground. The flash-symbol LED should turn on, and the shutter-speed indication should change to 1/250. If not, IC4 may be defective.

7. Check the AVO switches in the AV mode. With no lens, the largest aperture the external LCD will display is f/5.6. With a lens installed, you can turn the dial switch to set the maximum aperture of the particular lens. If you can't set the maximum aperture (reading will go beyond or won't reach the actual maximum aperture), check the AVO switches on the mirror box, the wiring to the main flex, Fig. 28, and the adjustment on the maximum-aperture control pin (same as A-series and other T-series Canons).

Note: For the tests on the AVO switches, see, *SWITCH LOCATIONS AND FUNCTIONS.*

8. For erratic exposures, you can check the light transmission in AV mode. If the diaphragm opening is inconsistent, the problem is probably a dirty aperture magnet or flush plate. If the diaphragm opening is consistent, check the shutter speeds in TV mode. Inconsistent shutter speeds may indicate dirty shutter magnets.

Troubleshooting the DC/DC converter:
1. Check for V-BAT to the red wire, Fig. 25. No voltage -- battery connections.

2. Check S0 at the white wire, Fig. 25. S0 should switch low when you close SW1 (signal that turns on DC/DC converter). If not, IC3 may be defective.

3. Check DC/DC out at the connection between the DC/DC converter and the motor flex, Fig. 25. DC/DC out should be 6V with SW1 closed.

4. Check VDD at the cathode of D4/D3, Fig. 29 -- around 4.5V; VDD should switch to over 5V with SW1 closed. If you don't get 4.5V without closing SW1, diode D3 may be open. Also check VDD at pin 58 of IC3, Fig. 30. If you get VDD at D3, but not at pin 58, check for continuity between pin 58 and D3. No continuity -- check the yellow wire from the motor flex to the main flex, Fig. 29.

5. Check E1 at the cathode of D5 or at the red E1 wire, Fig. 29 -- over 5V with SW1 closed. If not, yet DC/DC out is o.k., D5 may be open or have poor solder. Also check for E1 at the FD-flex connector, Fig. 28. No E1 -- check red E1 wire between motor flex and main flex, Fig. 29.

6. Check E2 at pin 3 of IC1, Fig. 30 -- over 5V with SW1 closed. If not, yet you do get E1, check the red E1 wire, Fig. 29, and for an open coil L1 (L1 is on the underside of the main flex, top rewind side -- check by measuring the resistance between the cathode of D5, Fig. 29, and pin 3

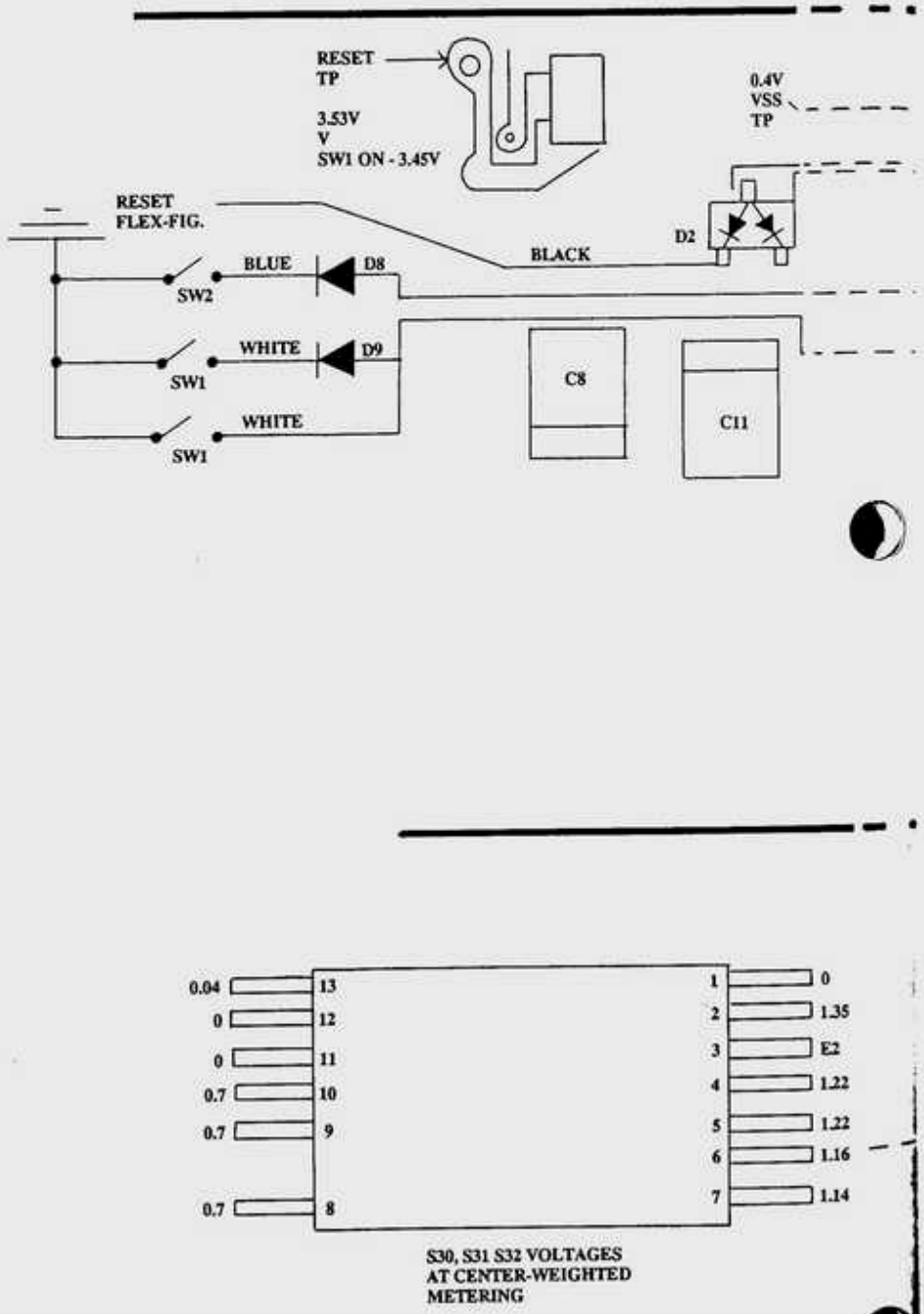
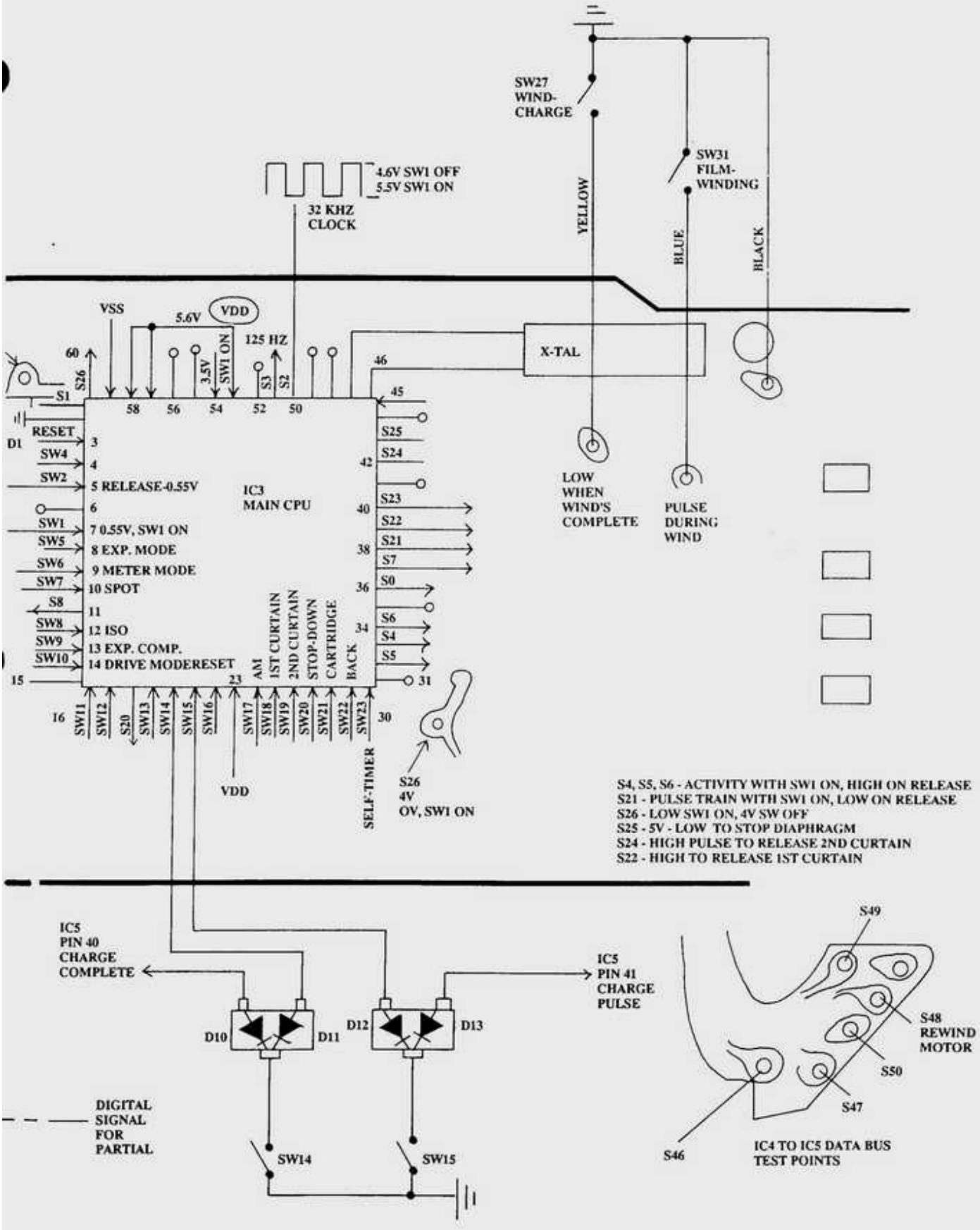


FIG. 30 - PICTORIAL, IC1 AND IC3 (TOP OF MAIN FLEX, UNDER EXTERNAL LCD)


SW27
WIND-
CHARGE
SW31
FILM-
WINDING
4.6V SW1 OFF
5.5V SW1 ON
32 KHZ
CLOCK
YELLOW
BLUE
BLACK
VSS
5.6V
VDD
125 HZ
X-TAL
60
S26
S1
58
56
54
52
50
46
45
RESET
D1
SW4
SW2
5 RELEASE-0.55V
IC3
MAIN CPU
SW1
7 0.55V, SW1 ON
SW5
8 EXP. MODE
SW6
9 METER MODE
SW7
10 SPOT
S8
11
SW8
12 ISO
SW9
13 EXP. COMP.
SW10
14 DRIVE MODERESET
15
16
23
30
31
42
40
38
36
34
S25
S24
S23
S22
S21
S7
S0
S6
S4
S5
AM
1ST CURTAIN
2ND CURTAIN
STOP-DOWN
CARTRIDGE
BACK
SELF-TIMER
SW11
SW12
S20
SW13
SW14
SW15
SW16
SW17
SW18
SW19
SW20
SW21
SW22
SW23
VDD
S26
4V
OV, SW1 ON
LOW
WHEN
WIND'S
COMPLETE
PULSE
DURING
WIND
S4, S5, S6 - ACTIVITY WITH SW1 ON, HIGH ON RELEASE
S21 - PULSE TRAIN WITH SW1 ON, LOW ON RELEASE
S26 - LOW SW1 ON, 4V SW OFF
S25 - 5V - LOW TO STOP DIAPHRAGM
S24 - HIGH PULSE TO RELEASE 2ND CURTAIN
S22 - HIGH TO RELEASE 1ST CURTAIN
IC5
PIN 40
CHARGE
COMPLETE
IC5
PIN 41
CHARGE
PULSE
D10
D11
D12
D13
DIGITAL
SIGNAL
FOR
PARTIAL
SW14
SW15
S49
S48
REWIND
MOTOR
S50
S47
S46
IC4 TO IC5 DATA BUS
TEST POINTS

of IC1 -- you should measure around 8.5 ohms, the resistance of L1).

7. Check VPP at the orange wire to the DC/DC converter, Fig. 25 --over 15V with SW1 closed. If not, the DC/DC converter is defective.

Testing the shutter block (removed):
1. Charge the shutter by pushing the charge lever, Fig. 14, from left to right. The curtains should move up and latch in the charged positions.

2. Mechanically release the 1st curtain by pulling the 1st-curtain release lever, Fig. 15, toward the center of the shutter.

3. Mechanically release the 2nd curtain by pulling the 2nd-curtain release lever, Fig. 15, toward the center of the shutter.

4. To check the magnets, charge the shutter. Then apply around 3V directly across the leads of the 1st-curtain magnet, Fig. 14. The 1st curtain should release. Apply the voltage across the 2nd-curtain magnet, Fig. 14, to release the 2nd curtain.

5. Check the 1st-curtain switch and the 2nd-curtain switch at the shutter-flex connector, Fig. 28. With the shutter charged, both switches should be closed -- both switch connections should connect to the ground connection. Release the 1st curtain -- only the 2nd-curtain switch should connect to ground. Release the 2nd curtain -- neither switch should connect to ground.

Troubleshooting steps for specific problems:
1. No operation, external LCD shows EEE, finder LED shows HELP (release partially depressed)

Note: Clear the error condition by removing and replacing the battery holder. Or momentarily short the yellow reset-switch wire to ground to clear the circuit, Fig. 28. The most common causes are probably the lens and the shutter.

Lens
If the camera only switches to error condition with the lens installed, check the diaphragm-operating ring of the lens. If the ring isn't moving smoothly, the excessive load will cause the camera to switch to error condition.

Shutter block
Check the solder to the shutter-flex connector, Fig. 28. Also check the mechanical operation. If the over-travel is insufficient, the curtains may fail to latch in the charged positions. Or the curtains may be damaged.

DC/DC converter
Check for VPP (around 18V) at the orange wire, Fig. 25. No voltage or low voltage -- DC/DC converter defective. If the shutter releases once -- but the curtains don't open -- and the camera then switches to error condition, the shutter may not be receiving VPP to operate the magnets. Check the orange-wire solder connections.

1st-curtain release
If the shutter doesn't open after release, and the camera then switches to error condition, the problem may be the 1st-curtain magnet, transistor TR1, or the release signal. Reset the circuit and check the signal at the 1st-curtain-release connection of the shutter-flex connector, Fig. 28. When you release the shutter, you should get a positive pulse (around 0.66V, 2ms).

***No* pulse -- IC3 or IC4**
Check the S22 signal at pin 39 of IC3, Fig. 30. When you release the shutter, pin 39 should switch high (signal to release 1st curtain). If not, IC3 is defective. If pin 39 does switch high, IC4 may be defective or have poor solder (pin 43 or 55).

***Pulse present* -- TR1 or 1st-curtain magnet**
See, *Testing the shutter block (Troubleshooting).*

2nd-curtain release
If the shutter stays open until the charge motor runs to recharge the shutter, check the 2nd-curtain release. Check at the 2nd-curtain-release connection of the shutter-flex connector, Fig. 28. After you release the shutter, you should get a positive pulse (signal to close the shutter) of around 0.66V and 2ms in duration.

***No pulse* -- IC3 or IC4**
Check the S24 signal at pin 42 of IC3, Fig. 30, and release the shutter. You should get a high pulse (signal to close 2nd curtain). No pulse -- IC3 defective (IC4 may be defective). Or, with the shutter open on a slow speed, short pin 42 of IC3 to V-BAT. If the 2nd curtain closes, IC4 is o.k. -- the problem is IC3. If the 2nd curtain doesn't release, IC4 may be defective or have poor solder (pin 54 or 46).

***Pulse present* -- TR2 or 2nd-curtain magnet**
See, *Testing the shutter block (Troubleshooting).*

D11 or D12
Open or poor solder, Fig. 28.

Charge motor runs briefly after reset, camera then switches to error condition:

Shutter switches
Check the solder connections to the 1st-curtain switch and the 2nd-curtain switch of the shutter-flex connector, Fig. 28. Both connections should be low (ground) with the shutter charged. If not, the switches may not be making good contact. Or one of the switches may fail to open (the 2nd-curtain switch may have slipped off the operating lever, Fig. 9, due to impact -- the switch then stays closed). Also check pin solder to IC3 (pins 25
and 26).

AE-charge switch (problem only occurs with lens)
Check continuity between the pink wire, top of flex, Fig. 28, and ground with the shutter charged. You should get direct continuity. No continuity -- check AE-charge switch for poor contact or adjustment. Also check solder to IC3 (pin 17).

Mirror switch SW13
Check at pin 19 of IC3, Fig. 30. You should get direct continuity to ground. Or short pin 19 to ground and reset the circuit. If you now get the proper LCD readout, check for

poor contact in the mirror switch, Fig. 13, and for poor contact in the front flex connector (between the SP flex and the main flex, 2nd contact from top).

2. Camera switches to low speed during operation, LCD drive-mode arrow flickering

Batteries
If the operating batteries are low, the camera switches automatically to low speed.

Lens
Check the diaphragm-operating ring of the lens. If the ring isn't moving smoothly, the excessive load will cause the camera to switch from high speed to low speed.

Charge gears
Clean and lubricate the gears, Fig. 22.

Wind-motor drive circuit
If the problem only occurs with film loaded, check the reverse rotation of the wind motor (see, *Tips for troubleshooting without disassembly*). If the wind motor doesn't run in the reverse direction, check transistors TR4 and TR5, Fig. 9. If the transistors are o.k., IC10 or IC5 could be defective.

3. No operation (no LCD or release)

Battery connections
Check V-BAT between the red and black wires to the DC/DC converter, Fig. 25. No voltage -- battery contacts or wiring.

Main switch SW16
Check at the light-blue wire to the main flex, top rewind end, Fig. 28. With the main switch in the A position, you should get direct continuity to ground.

Reset switch, constantly closed
Check at the yellow reset-switch wire, Fig. 28 (direct continuity to ground if reset switch is closed). Or check VDD, Fig. 29. If VDD is around 1.2V, the reset switch may be closed or the yellow reset-switch wire shorted to ground.

DC/DC converter
See, *Testing the DC/DC converter (Troubleshooting).*

IC3
Check the S0 signal at the white wire to the DC/DC converter, Fig. 25, or at pin 36 of IC3, Fig. 30. The signal should switch low when you close SW1 or SW2 (signal that turns on DC/DC converter). Also check the clock signal at pin 50, Fig. 30 (32KHz square wave).

Capacitor C6
Check for a shorted C6, Fig. 28.

3. No release, finder LEDs o.k.

Release switch SW2
Short the blue wire, Fig. 29, to ground. If the shutter then releases, the problem is in the release-switch block (SW2, wiring).

Diode D8
Check at pin 5 of IC3 and fully depress the release button -- pin 5 should switch low. If not, D8 may be open. Or short pin 5 to ground -- if the shutter then releases, the problem is in SW2, D8, or the pin 5 solder.

Release magnet MG2
Unsolder the release-magnet wires (orange and black) from the top of the flex, Fig. 28. Then apply around 3V between the release-magnet wires (+ to orange, - to black). The mirror should release. If not, the problem is the release magnet. If the LCD drive-mode arrow flickers (release probably erratic or fails after the camera has been sitting), the problem may be a dirty release-magnet interface.

Alternate test: Short the release-magnet TP, Fig. 5, to ground. If the release magnet is o.k., the mirror will release.

Release signal
Check for battery voltage to the orange release-magnet wire. Check at the black release-magnet wire or the release-magnet TP and depress the release button. The signal should pulse low. If not, IC3 or IC4 may be defective. Check solder at IC3 pin 5 and at IC4 pin 52. Or close SW1 and short pin 32 (S5) of IC3, Fig. 30, to ground; if IC4 is o.k., the mirror will release.

4. Charge motor runs continuously

Charge-complete switch SW14
Check between the orange wire (bottom) and ground as the charge motor is running. You should get a pulse. If the orange wire doesn't switch low (direct continuity to ground), check for poor contact in SW14, Fig. 21, or poor solder to the orange wire. Or, while the charge motor is running, short the orange wire, Fig. 28, to ground; if the charge motor then stops, the problem is in SW14.

Charge-pulse switch SW15
Check between the green wire, Fig. 29, and ground as the charge motor is running. You should get a square-wave signal (around 4V p-p). No signal -- check for poor contact in SW15, Fig. 21, or poor solder to the green wire.

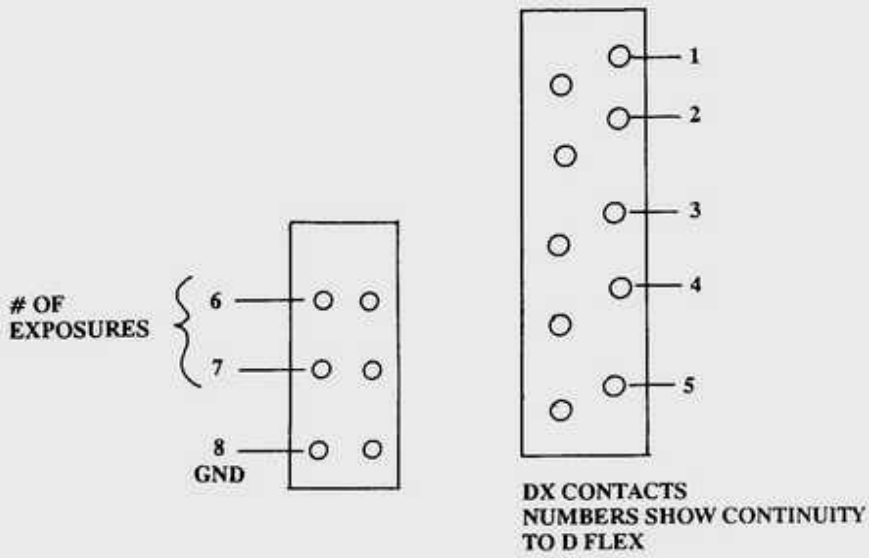
D10, D13
Open or poor solder, Fig. 28. If o.k., IC5 may be defective.

5. Diaphragm always stops down fully

Flush plate SW24
Check at the purple wire and release the shutter. You should get a pulse signal as the diaphragm closes. No signal -- poor contact between flush plate and brush, Fig. 12, or poor solder to purple wire.

Signal to aperture magnet
Check at the blue MG1 wire, top of main flex, Fig. 28. The signal should switch low when you release the shutter; the signal should then switch high to de-energize the aperture magnet. If the signal doesn't switch high, IC3 or IC4 may be defective.

IC3, IC4
Check the S25 signal at pin 43 of IC3. S25 should be around 5V with SW1 on. When you release the shutter, S25 should switch low -- the length of time between shutter release and S5 switching low determines the diaphragm setting. If S25 checks o.k., IC4 may be defective.



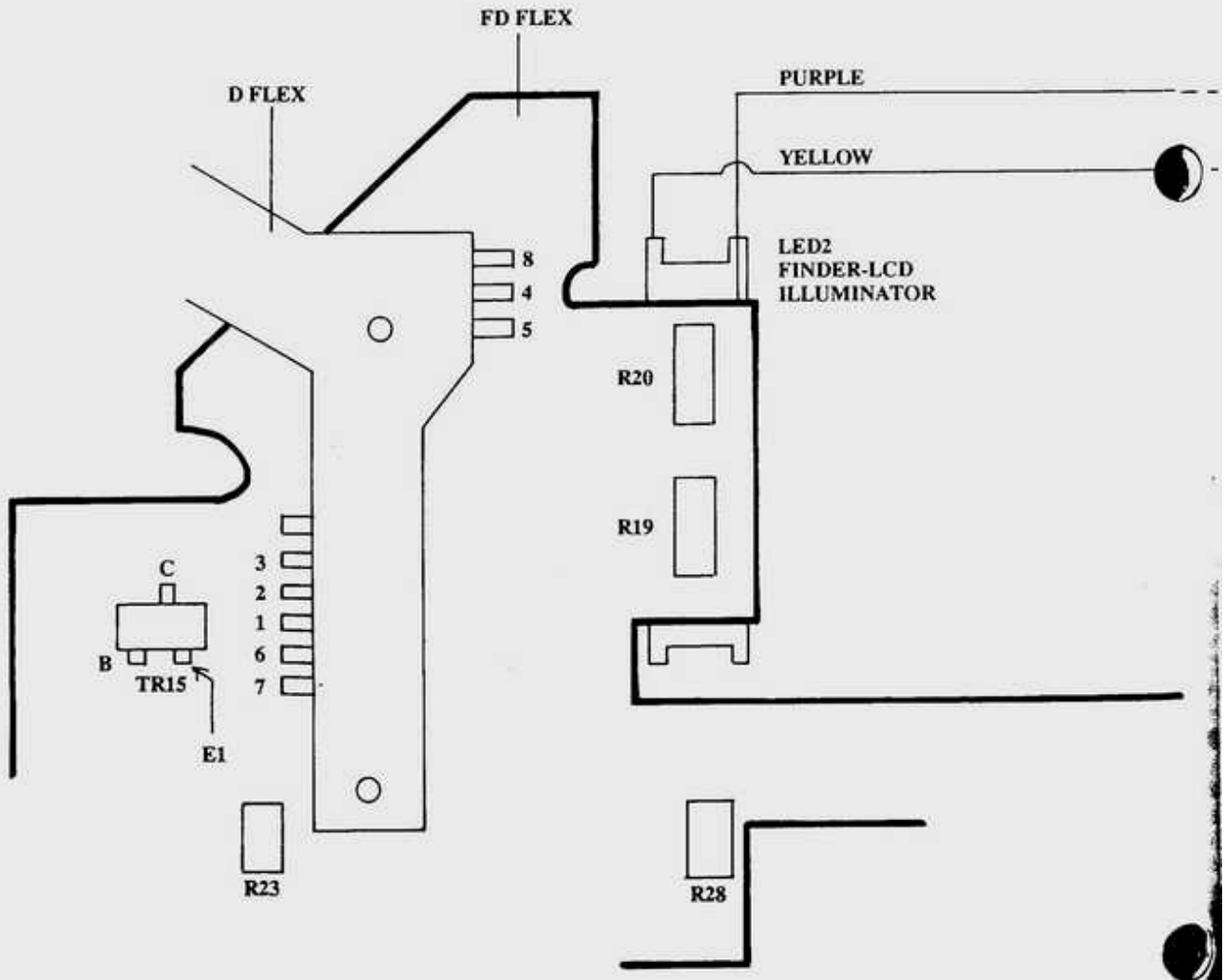
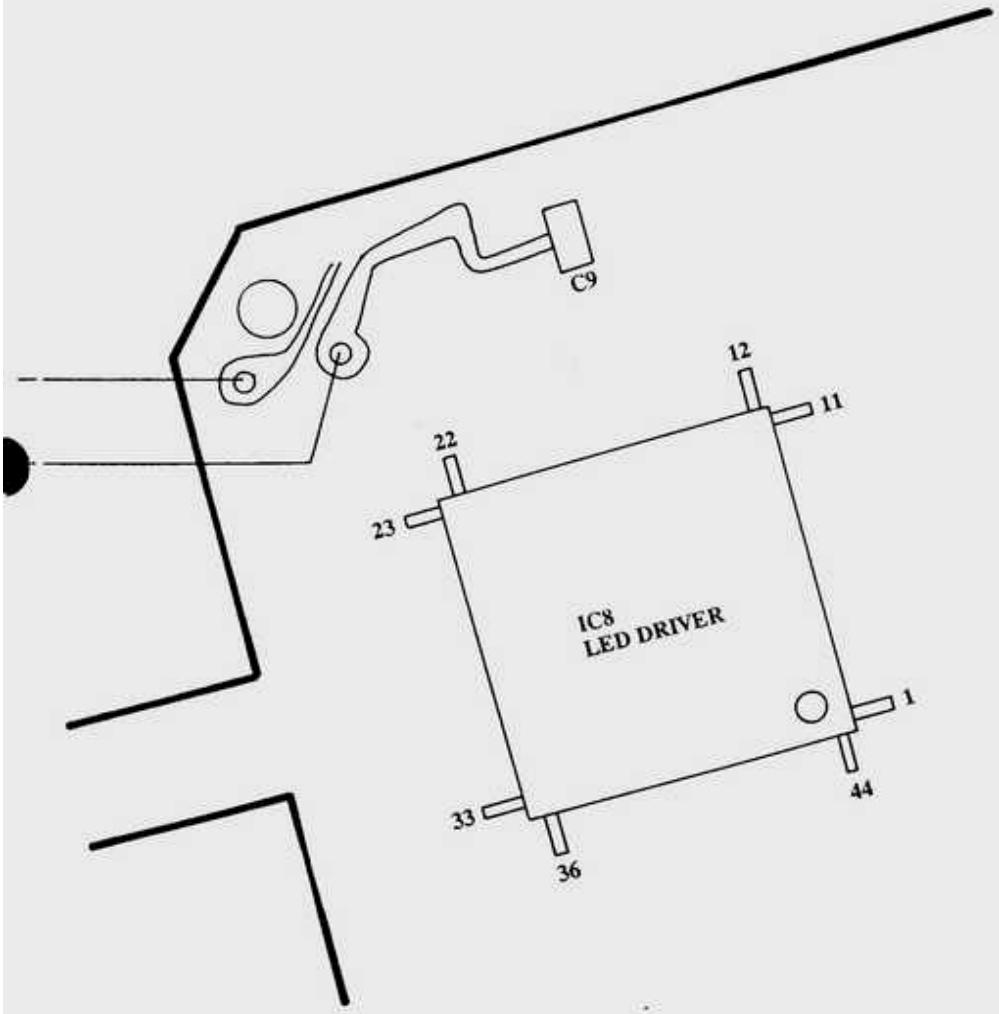


FIG. 31 - PICTORIAL, FD FLEX AND D FLEX


C9
12
11
22
23
IC8
LED DRIVER
1
33
44
36

6. Diaphragm always stays fully open

Aperture magnet
Check the coil between the blue and red wires, top of main flex, Fig. 28 (around 325 ohms).

Signal to aperture magnet
Check at the blue MG1 wire, top of main flex, Fig. 28. The signal should switch low when you release the shutter (and then high to de-energize the aperture magnet). If the signal doesn't switch low, IC3 or IC4 may be defective.

IC3, IC4
Check the S25 signal as described in (5) above.

6. Camera switches to rewind in mid-roll, or film runs completely through on auto load

Wind-complete switch SW27
Check between the yellow wire by IC3, Fig. 30, and ground as the camera is transporting film. You should get a pulse signal -- high during the advance, low at the end of the advance. Or check continuity to ground as you rotate the sprocket; the continuity should make and break as the sprocket turns. No signal -- poor contact in SW27 or poor solder to the yellow wire.

7. No rewind, film runs completely through on auto load, no film-bar movement

Film-winding switch SW31
Check between the blue wire by IC3, Fig. 30, and ground as the camera is transporting film. You should get a square-wave pulse. Or check continuity to ground as you rotate the sprocket; the continuity should make and break as the sprocket turns. No signal -- poor contact in SW31 or poor solder to blue wire.

8. No operation, "bc" LCD flickering on external LCD

Charge motor
Check by applying around 3V directly across the charge-motor terminals (polarity only determines direction of rotation). The charge motor should run, charging the shutter and mirror.

IC10, charge-motor transistors
Check by removing the grip cover. Check at the pin ? TP or the pin TP as you reset the circuit (momentarily short the yellow reset wire to ground). You should get a pulse at each TP (around 2V).

Front flex connector
Check for poor contact, Fig. 4.

9. Wind motor doesn't run (no film advance)

Wind motor M1
Connect around 3V across the red and black M1 wires, Fig. 9. With + on the red lead, M1 should run in the forward direction (low speed); both the sprocket and the spool should turn. With + on the black lead, M1 should run in the reverse direction (high speed); only the spool should turn.

Transistors TR3 and TR6
Either TR3 or TR6, Fig. 9, may be open or have poor solder. If both transistors are o.k., the wind motor will run in the forward direction when you short together the bases of TR3 and TR6.

IC10
To check the output signals, disengage the back latch. Then push in the cartridge detector to apply the motor signals. The base of TR3 should switch low (from around 6V to around 5.4V). The base of TR6 should switch high (from 0V to around 0.6V).

10. Film won't rewind

Note: If the camera doesn't switch to rewind after the last exposure according to the DX code, check the solder between the D flex and the main flex, Fig. 31. If the camera won't rewind even at the end of the roll or with the manual-rewind button depressed, check the following:

Rewind motor M3
Connect around 3V between the pink (+) and blue wires at the bottom of the camera, Fig. 29. The rewind motor should run and turn the rewind fork (the rewind motor will run with the polarity reversed, but the rewind fork won't turn).

Transistors TR11, TR12, TR13, TR14
Short together pins 6 and 8 of IC9 (with or without film). The rewind motor should run in the forward direction and turn the rewind fork. Short together pins 5 and 7 of IC9. The rewind motor should run in the reverse direction and free the fork. If the rewind motor won't run in the forward direction, check transistors TR11 and TR14, Fig. 29. If the rewind motor won't run in the reverse direction, check transistors TR12 and TR13.

IC9
With the film at the end of the roll, check the voltage at pin 12 of IC9 and push the manual-rewind button. Pin 12 should switch to around 1.8V. If so, yet the rewind motor won't run, IC9 may be defective.

IC4, IC5
If you don't get the signal at pin 12 of IC9, short the S48 TP, Fig. 30, to ground. If the rewind motor runs, IC5 is o.k. The problem may then be IC4. If the rewind motor still doesn't run, IC5 may be defective.

11. Always misload condition, even though film loads properly

Wind-motor drive circuit
Check the reverse rotation of the wind motor (see, *Tips for troubleshooting without disassembly*). If the wind motor fails to run in the reverse direction, TR5 or TR4, Fig. 9, may be open or have poor solder. Or IC10 or IC5 may be defective.

12. Finder LEDs and/or LCD won't turn on

SW1
If the finder LEDs won't turn on when you push the release button part way, but turn on after the exposure, check SW1 and D9, Fig. 29. The white wire should switch low when you push the release button part way. If not, the problem is in SW1 or the wiring to the release-switch block, Fig. 29. The anode of D9 should also switch low (around 0.5V). If not, D9 is open or has poor solder.

Flex connector
Check for the SW1 signal at pin 7 of IC3, Fig. 30. Pin 7 should switch low (around 0.5V) when you push the release button part way. If not, check for poor contact in the front flex connector (you should have direct continuity between the anode of D9, Fig. 29, and pin 7 of IC3.

Connections to FD flex
Check the solder connections between the FD flex and the main flex, Fig. 28. Check for V-BAT and E1 at the connections indicated. No V-BAT or E1 indicates a break in the flex or a poor solder connection to the FD flex.

IC4
Check the power signal at the S11 connection of the FD flex, Fig. 28. S11 should switch to around 5V when you close SW1. If not, IC4 may be defective.

IC3
Check the clock signal at the S15 connection of the FD flex, Fig. 28. You should get the 250KHz square wave when you close SW1. If not, IC3 may be defective.

FD flex
If the finder LED won't turn on, IC8 may be defective. IC7 may be defective if the finder LCD won't turn on. You can replace the complete FD flex, including both IC's and both displays.

13. Camera doesn't automatically set ISO (or DX always sets ISO 5000)

D-flex connections
Check the connections between the D flex and the FD flex, Fig. 31. You can check continuity between each connection on the D flex and the DX contacts as shown in Fig. 31 (DX contact #1 should have direct continuity to D-flex connection #1, etc.).

FD-flex connection
Check the connection between the S17 land on the FD flex and the main flex, Fig. 28.

TR15
Check the voltage to each pair of DX contacts, Fig. 31 (except the ground pair). You should measure around 2.25V with SW1 closed. No voltage -- TR15, Fig. 31, open, or IC8 (not turning on TR15).

IC8
Check the signal at the S17 connection of the FD-flex connector, Fig. 28, as you close the camera back on a DX-coded cartridge. You should see a momentary digital signal as IC8 inputs the ISO information to IC5; S17 should then switch high (around 5V). If you don't get the digital-signal input, IC8 may be defective. If you do get the input, yet the camera won't change the ISO automatically, IC5 or IC3 may be defective.

14. All LEDs turn on when you close SW1

FD-flex connection
Check for poor solder to the S11 connection of the FD flex, Fig. 28. If o.k., IC8 may be defective.

15. Excessive leakage current

DC/DC converter
Check DC/DC out at the DC/DC converter, Fig. 25; you should measure 0V until you close SW1. If you measure a voltage, disconnect the white S0 wire from the DC/DC converter, Fig. 25. If you still measure a voltage output, the DC/DC converter is leaking. If DC/DC out switches to 0V with the white wire disconnected, IC3 may be defective (S0 stays low, keeping the DC/DC converter switched on).

IC4
Unsolder the red and orange magnet wires (MG1 and MG2), Fig. 28. If the current drain stops, the leakage is in IC4.

IC3, reset IC, IC6
Unsolder the yellow VDD wire, Fig. 29. If the current drain stops, the leakage is in IC3, IC6, or the reset IC. Check the reset IC by unsoldering the red VDD wire from the reset flex, Fig. 28. Current drain stops -- reset IC defective. To check IC6, you can desolder the VDD connection, Fig. 26. Current drain stops -- IC6 defective.

Main flex
Desolder the V-BAT pin from the main flex, Fig. 29. If the current draw stops, the drain is in the main flex or the FD flex. Desolder the V-BAT pin of the FD-flex connector, Fig. 28. If the current drain then stops, the leakage is in the FD flex (IC8). If the drain doesn't stop, the leakage is in the main flex.

Motor flex
Disconnect the red wire between the DC/DC converter and the motor flex, Fig. 29. If the current drain stops, the problem is in the motor flex (IC9, IC10). If the current drain continues, the DC/DC converter may be the problem.

OTHER COMMENTS
1. You can drop out the focusing screen from inside the lens opening. Standard focusing screen --CG1-0860-000.

2. You can replace the shutter block as a complete unit -- **CG1-0871-000*** (around $80). Or you can replace individual parts.

curtains* -- CS1-6733-000
thick washer -- XD-1102-126
thin washer -- XD-1102-122
booster spring -- CS1-6732-000

3. The parts of the external LCD are supplied separately from the main flex. The external LCD is not supplied as a complete unit, but you can get the individual parts:

AF7-5002-000 -- external LCD
CH2-6003-000 -- OLC connector (2 electrical connectors under the LCD)
CA1-6565-000 -- reflector, OLC light (reflector that sits under the LCD for the illuminator)
CA1-6563-000 -- OLC holder (2 clips that hold the LCD)
WG1-0275-000 -- lamp (illumination lamp for the external LCD)
CY1-6561-000 -- OLC case
CY1-1236-000 -- OLC PCB assembly (circuit board with the LCD driver)
CA1-6562-000 -- OLC baseplate

4. Circuit boards:

DC/DC converter -- CH3-0021-000
main flex -- CY1-1252-000
motor flex -- CG1-0857-000

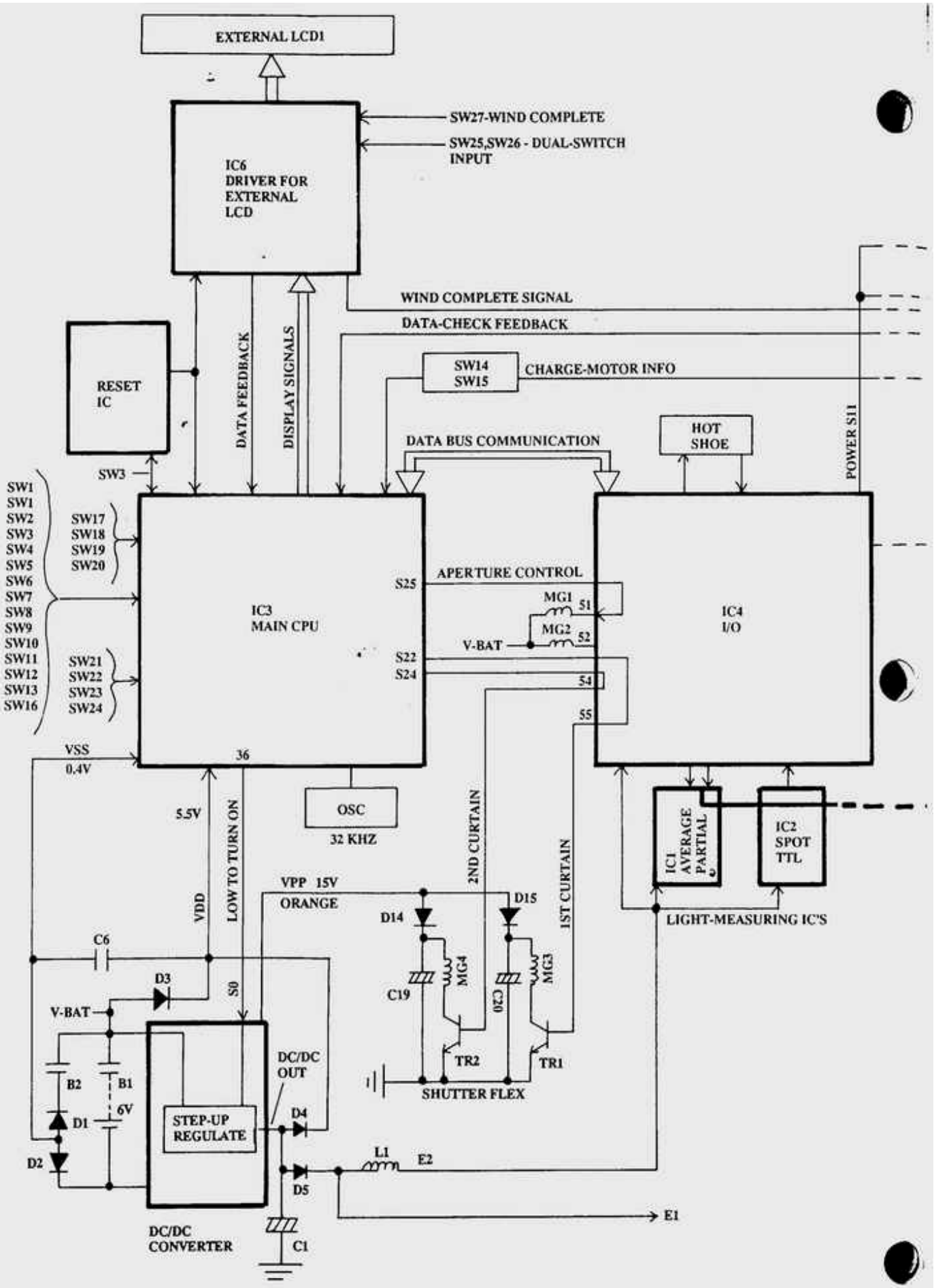
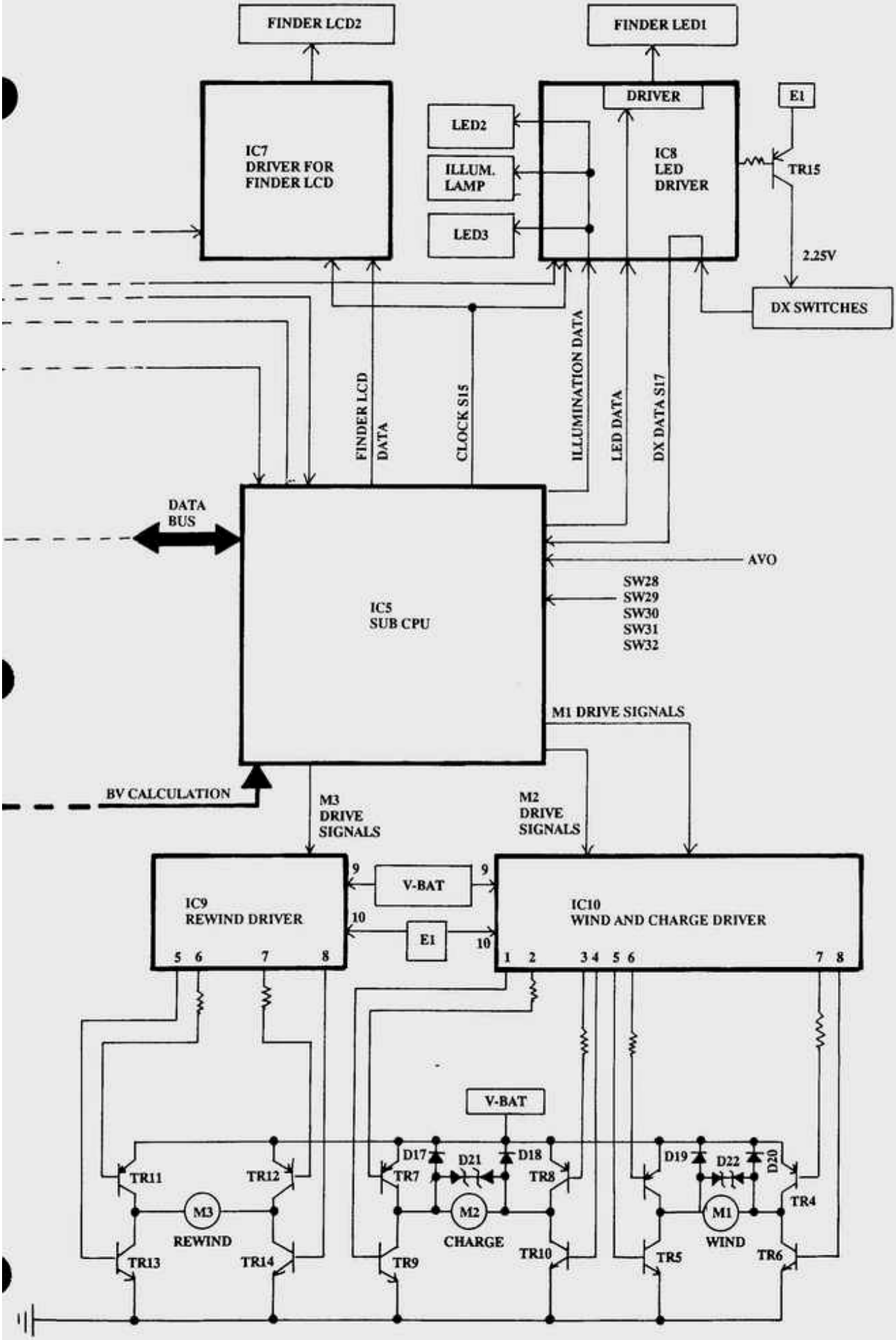


FIG. 32 - BLOCK DIAGRAM AND PARTIAL SCHEMATIC


FINDER LCD2
FINDER LED1
IC7
DRIVER FOR
FINDER LCD
DRIVER
E1
LED2
ILLUM.
LAMP
LED3
IC8
LED
DRIVER
TR15
2.25V
DX SWITCHES
FINDER LCD
DATA
CLOCK S15
ILLUMINATION DATA
LED DATA
DX DATA S17
DATA
BUS
AVO
SW28
SW29
SW30
SW31
SW32
IC5
SUB CPU
M1 DRIVE SIGNALS
BV CALCULATION
M3
DRIVE
SIGNALS
M2
DRIVE
SIGNALS
IC9
REWIND DRIVER
V-BAT
E1
IC10
WIND AND CHARGE DRIVER
V-BAT
TR11
TR12
M3
REWIND
TR13
TR14
D17
TR7
D21
D18
TR8
M2
CHARGE
TR9
TR10
D19
D22
D20
TR4
M1
WIND
TR5
TR6

SP flex -- CY1-1234-000
reset flex assembly -- CG9-2691-000
FD flex -- CY1-1253-000

Note: The FD flex includes the LED display, but not the finder LCD. Internal LCD -- AF7-5003-000

5. Mirror-box parts:

AE unit (including aperture magnet) -- CG1-0869-000
auto-diaphragm unit (including release magnet) -- CG1-0868-000
mirror-mechanism unit -- CG1-0867-000

6. Motors:

rewind motor -- WL1-9061-000
charge motor -- WL1-9060-000
wind motor -- WL1-9059-000

7. IC's:

IC1 -- CH4-0161-000
IC2 -- replace SP flex
IC3 -- CH4-0153-000
IC4 -- CH4-0155-000
IC5 -- CH4-0154-000
IC6 -- replace OLC PCB assembly
IC7 -- CH4-0157-000
IC8 -- CH4-0158-000
IC9, IC10 -- CH4-0159-000

8. Transistors:

Shutter transistors TR1 and TR2 -- WA2-0731-000.
Motor transistors --
TR3, TR4, TR7, TR8, TR11, TR12 (PNP) -- WA2-0411-000
TR5, TR6, TR9, TR10, TR13, TR14 (NPN) -- WA2-0216-000
DX-code transistor TR15 -- WA2-0730-000

9. Covers, external parts:

top cover -- CG1-0851-000* (around $40)
front cover -- CG9-2684-000
rubber sheet (bottom of battery case) -- CA1-6305-000
battery-pack assembly (battery holder) -- CG9-2683-000
battery case --
battery case 1 (front section) -- CA1-6303-000
battery case 2 (rear section) -- CA1-6304-000
eyepiece-lever cap -- CA1-6383-000
main switch assembly -- CG9-2678-000

10. Winding gears (Fig. 22):

winding-2 gear -- CS1-0808-000
winding-3 gear -- CS1-0810-000
winding-4 gear -- CY1-1243-000
winding-7 gear -- CS1-0817-000
winding-9 gear -- CS1-0820-000
coil spring -- CS1-5883-000

11. Other:

tripod socket -- CA1-6369-000
tripod cap (cap at end of tripod socket) -- CA1-6475-000
memory battery -- WK1-9022-000
connector (2 gold connectors between layers of front flex connector) -- CH2-6005-000
switch-panel assembly -- CG9-2676-000*

*frequently replaced parts